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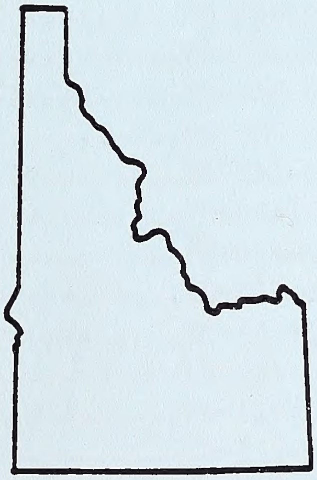
BLM Wilderness Study Areas

Idaho

August 11, 1988



prepared by the U.S. Geological Survey

in cooperation with the U.S. Bureau of Mines

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  Henry´s Lake ID-035-077 48
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  Sand Butte ID-057-008 88
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  Little Jacks Creek ID-111-006 92
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  Bruneau River ID-111-017 32
  Sheep Creek West ID-111-036A 32
  Upper Deep Creek ID-111-044 95

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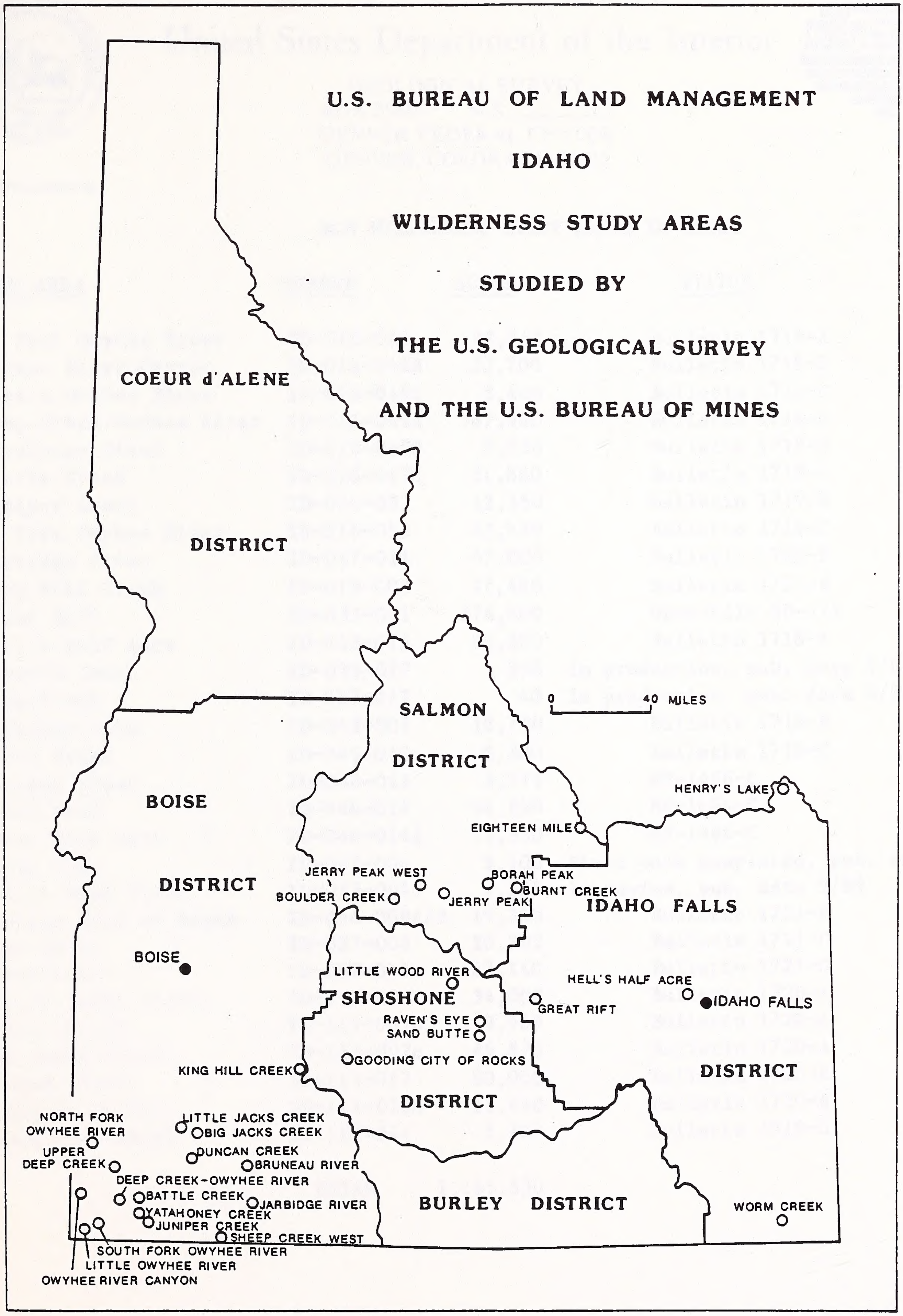
U.S. BUREAU OF LAND MANAGEMENT
# IDAHO
WILDERNESS STUDY AREAS
STUDIED BY
THE U.S. GEOLOGICAL SURVEY
AND THE U.S. BUREAU OF MINES



United States Department of the Interior

GEOLOGICAL SURVEY
BOX 25046 M.S. ______
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DENVER, COLORADO 80225

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

BLM WILDERNESS STUDY AREAS IN IDAHO

BLM AREA	NUMBER	ACRES	STATUS
N. Fork Owyhee River	ID-016-040	39,745	Bulletin 1719-A
Owyhee River Canyon	ID-016-048B	33,700	Bulletin 1719-E
Little Owyhee River	ID-016-048C	8,460	Bulletin 1719-C
Deep Creek/Owyhee River	ID-016-049A	67,400	Bulletin 1719-D
Yatahoney Creek	ID-016-049D	9,550	Bulletin 1719-B
Battle Creek	ID-016-049E	31,880	Bulletin 1719-B
Juniper Creek	ID-016-052	12,350	Bulletin 1719-B
S. Fork Owyhee River	ID-016-053	42,430	Bulletin 1719-F
Jarbidge River	ID-017-011	47,000	Bulletin 1720-B
King Hill Creek	ID-019-002	27,680	Bulletin 1721-B
Great Rift	ID-033-011	374,400	Open-file 80-475
Hell´s Half Acre	ID-033-015	66,200	Bulletin 1718-A
Henry´s Lake	ID-035-077	350	In production, pub. date 9/88
Worm Creek	ID-037-077	40	In production, pub. date 9/88
Eighteen Mile	ID-043-003	18,700	Bulletin 1718-B
Burnt Creek	ID-045-012	8,300	Bulletin 1718-C
Boulder Creek	ID-046-013	2,573	MF-1466-C
Jerry Peak	ID-046-014	46,150	MF-1466-C
Jerry Peak West	ID-046-014A	13,530	MF-1466-C
Borah Peak	ID-047-004	3,100	Field work completed, pub. date 9/90
Little Wood River	ID-053-004	4,385	In review, pub. date 9/89
Gooding City of Rocks	ID-054-008A/B	19,350	Bulletin 1721-A
Sand Butte	ID-057-008	20,792	Bulletin 1721-C
Raven´s Eye	ID-057-010	67,110	Bulletin 1721-C
Little Jacks Creek	ID-111-006	34,000	Bulletin 1720-A
Duncan Creek	ID-111-007b	9,400	Bulletin 1720-A
Big Jacks Creek	ID-111-007c	49,875	Bulletin 1720-A
Bruneau River	ID-111-017	90,000	Bulletin 1720-B
Sheep Creek West	ID-111-036a	11,680	Bulletin 1720-B
Upper Deep Creek	ID-111-044	5,700	Bulletin 1919-G
	TOTAL	1,165,830	

U.S. BUREAU OF LAND MANAGEMENT WILDERNESS STUDY AREAS IN IDAHO
EVALUATED BY THE U.S. BUREAU OF MINES AND THE U.S. GEOLOGICAL SURVEY
AUGUST 11, 1988

WILDERNESS STUDY AREA	NUMBER	IDENTIFIED RESOURCES (KNOWN)	MINERAL RESOURCE POTENTIAL* (UNDISCOVERED) HIGH	MINERAL RESOURCE POTENTIAL* (UNDISCOVERED) MODERATE
North Fork Owyhee River	ID-016-040	several sq mi of decorative stone		
Owyhee River Canyon	ID-016-048B	none		
Little Owyhee River	ID-016-048C	none		
Deep Creek/Owyhee River	ID-016-049A	none		
Yatahoney Creek	ID-016-049D	none		
Battle Creek	ID-016-49E	none		
Juniper Creek	ID-016-052	none		
South Fork Owyhee River	ID-016-053	none		
Jarbidge River	ID-017-011	none		geothermal resources, jasper
King Hill Creek	ID-019-002	none		geothermal resources; small area of antimony, arsenic, gold
Great Rift	ID-033-011	none		
Hell's Half Acre	ID-033-015	43,000 tons of decorative stone		
Henry's Lake	ID-035-077	none		geothermal resources
Worm Creek	ID-037-077	none		oil and gas
Eighteen Mile	ID-043-033	none		gypsum, lead, zinc, silver, oil and gas
Burnt Creek	ID-045-012	none	high ←	limestone suitable for cement
Boulder Creek	ID-046-013	none		
Jerry Peak	ID-046-014	none		barite
Jerry Peak West	ID-046-014A	none		barite
Little Wood River	ID-053-004	none		silver, barite, copper, lead, zinc, gold, and tungsten
Gooding City of Rocks	ID-054-008A/B	230 million tons of diatomite	diatomite	geothermal resources
Sand Butte	ID-057-008	2 tons of decorative stone		
Raven's Eye	ID-057-010	4,000 tons of decorative tone		
Little Jacks Creek	ID-111-006	none		
Duncan Creek	ID-111-007B	none		
Big Jacks Creek	ID-111-007C	none		
Bruneau River	ID-111-017	none		geothermal resources and jasper
Sheep Creek West	ID-111-036A	none		
Upper Deep Creek	ID-111-044	none		small gold placers

* areas of only moderate or high potential listed

DEFINITION OF LEVELS OF MINERAL RESOURCE POTENTIAL AND CERTAINTY OF ASSESSMENT

Definitions of Mineral Resource Potential

LOW mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics define a geologic environment in which the existence of resources is unlikely. This broad category embraces areas with dispersed but insignificantly mineralized rock as well as areas with few or no indications of having been mineralized.

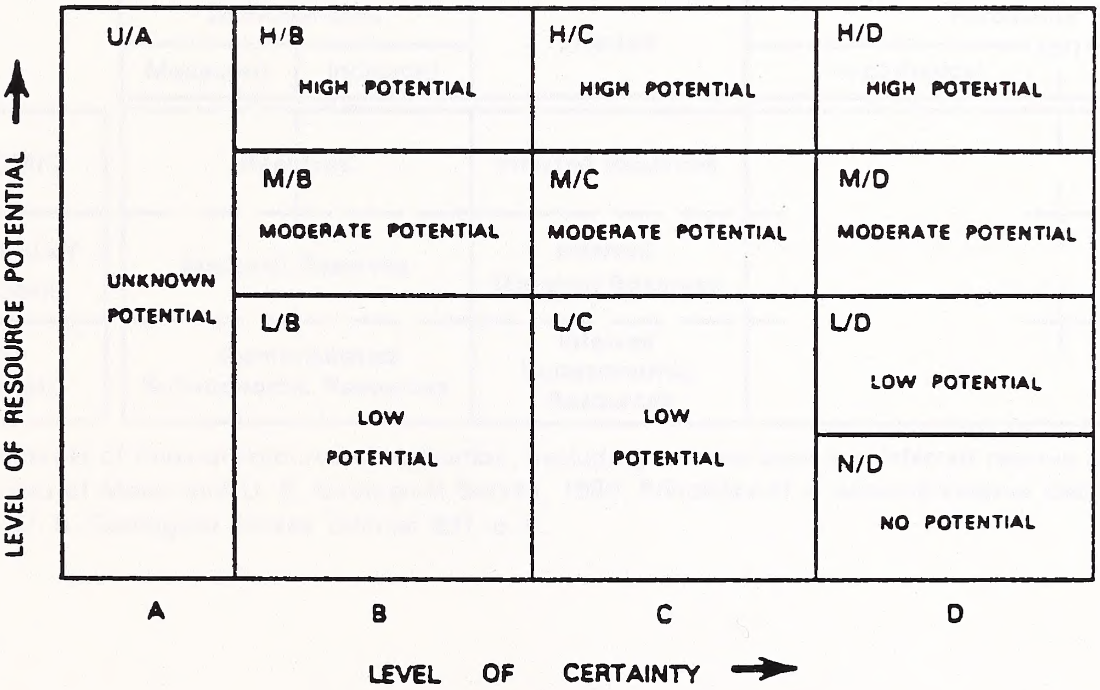
MODERATE mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a reasonable likelihood of resource accumulation, and (or) where an application of mineral-deposit models indicates favorable ground for the specified type(s) of deposits.

HIGH mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a high degree of likelihood for resource accumulation, where data support mineral-deposit models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential to an area requires some positive knowledge that mineral-forming processes have been active in at least part of the area.

UNKNOWN mineral resource potential is assigned to areas where information is inadequate to assign low, moderate, or high levels of resource potential.

NO mineral resource potential is a category reserved for a specific type of resource in a well-defined area.

Levels of Certainty



A. Available information is not adequate for determination of the level of mineral resource potential.
B. Available information suggests the level of mineral resource potential.
C. Available information gives a good indication of the level of mineral resource potential.
D. Available information clearly defines the level of mineral resource potential.

Abstracted with minor modifications from:

Taylor, R. B., and Steven, T. A., 1983, Definition of mineral resource potential: Economic Geology, v. 78, no. 6, p. 1268–1270.

Taylor, R. B., Stoneman, R. J., and Marsh, S. P., 1984, An assessment of the mineral resource potential of the San Isabel National Forest, south-central Colorado: U.S. Geological Survey Bulletin 1638, p. 40–42.

Goudarzi, G. H., compiler, 1984, Guide to preparation of mineral survey reports on public lands: U.S. Geological Survey Open-File Report 84–0787, p. 7, 8.

RESOURCE / RESERVE CLASSIFICATION

	IDENTIFIED RESOURCES			UNDISCOVERED RESOURCES	
	Demonstrated		Inferred	Probability Range (or)	
	Measured	Indicated		Hypothetical	Speculative
ECONOMIC	Reserves		Inferred Reserves		
MARGINALLY ECONOMIC	Marginal Reserves		Inferred Marginal Reserves		
SUB-ECONOMIC	Demonstrated Subeconomic Resources		Inferred Subeconomic Resources		

Major elements of mineral resource classification, excluding reserve base and inferred reserve base. Modified from U. S. Bureau of Mines and U. S. Geological Survey, 1980, Principles of a resource/reserve classification for minerals: U. S. Geological Survey Circular 831, p. 5.

RESULTS OF STUDIES

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Denver Federal Center, M.S. 922
Denver, CO 80225

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Chapter A

Mineral Resources of the North Fork Owyhee River Wilderness Study Area, Owyhee County, Idaho

By SCOTT A. MINOR and DONNIE SAWATZKY
U.S. Geological Survey

ANDREW M. LESZCYKOWSKI
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1719–A

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
OWYHEE RIVER REGION, IDAHO AND NEVADA

Mineral Resources of the North Fork Owyhee River Wilderness Study Area, Owyhee County, Idaho

By Scott A. Minor *and* Donnie Sawatzky
U.S. Geological Survey

Andrew M. Leszcykowski
U.S. Bureau of Mines

SUMMARY

Abstract

The North Fork Owyhee River Wilderness Study Area (ID-016-040), within the southern Owyhee Mountains in southwest Idaho, encompasses 49,470 acres, of which the U.S. Geological Survey and the U.S. Bureau of Mines were asked to study 39,745 acres. Hereafter, the terms "study area" and "wilderness study area" refer only to the smaller acreage. Field work for this report was carried out between 1984 and 1985. No mines or prospects are located in the study area, although a few borrow pits exist just outside its southern boundary. The only identified resource is blocky basalt suitable for use as building or decorative stone. The study area has a low resource potential for gold, silver, zinc, and uranium. The potential for petroleum and natural gas and geothermal energy is unknown.

Character and Setting

The North Fork Owyhee River Wilderness Study Area is located in the southern Owyhee Mountains in southwest Idaho, about 75 mi southwest of Boise (fig. 1). The area is situated along a stream-dissected plateau with canyons as deep as 400 ft. The study area is underlain by a thick pile of Miocene (about 5 to 24 million years before present) volcanic flows and minor interbedded sedimentary rocks. A thick rhyolite ash-flow tuff sheet is exposed throughout most of the study area; the tuff is overlain in the southern part of the study area by another rhyolite ash-flow tuff and a younger sequence of thin basalt flows and interbedded sedimentary rocks. The older ash-flow tuff fills a collapse caldera formed due to the emplacement of the tuff. Several small-displacement normal faults of various trends cut the rocks. The rhyolite ash-flow tuffs are also intensely fractured locally.

There are no known mines, prospects, claims, or mineral leases in the study area or its immediate vicinity. Several small borrow pits for road construction material exist along the southern boundary (fig. 2).

Identified Resources

The only identified resource in the study area is blocky basalt suitable for use as building or decorative stone. The thin, blocky slabs of basalt occur over an area of several square miles in the southern part of the study area.

Mineral Resource Potential

Gold, silver, zinc, and uranium have minor resource potential in the wilderness study area (fig. 2). The potential for geothermal energy and petroleum and natural gas is unknown.

Two mining districts occur in the region near the wilderness study area: the South Mountain (silver-lead-zinc) and the Silver City (gold-silver) districts. Mineralization in the former takes the form of silver-lead replacement veins and silver-lead-zinc skarn within regionally metamorphosed rocks. The Silver City district, in particular the Delamar mine area, is characterized by epithermal mineralization along Miocene normal faults and fractures within a contemporaneous, inferred silicic ring complex. Anomalous concentrations of antimony, arsenic, copper, mercury, selenium, and zinc are associated with the gold-silver deposits.

Relatively high concentrations of arsenic, molybdenum, silver, and zinc have been detected in samples collected in the wilderness study area. A similar geologic environment (caldera-related silicic volcanic rocks and contemporaneous faults and fractures) and trace-element anomalies similar to those in the Silver City district suggest that

epithermal mineralization has occurred beneath the study area. No mineral deposits or evidence of secondary hydrothermal alteration have been found in the area. Thus, the study area is judged to have a low resource potential for gold, silver, and zinc (fig. 2).

Weakly anomalous uranium concentrations occur in a few places in the southern part of the wilderness study area. The rhyolite ash-flow tuffs that underlie most of the study area have relatively high background levels of uranium and are probably the source of the anomalies. Therefore, the study area is considered to have a low resource potential for uranium (fig. 2).

No evidence of geothermal activity exists in the wilderness study area, and pertinent subsurface data is lacking to quantify the resource potential. The study area is considered to have an unknown potential for geothermal energy.

No evidence of hydrocarbons has been found in the study area, and pertinent subsurface data is lacking to quantify resource potential. The study area has an unknown potential for petroleum and natural gas.

INTRODUCTION

Character and Setting

The North Fork Owyhee River Wilderness Study Area (ID-016-040), located about 30 mi southeast of Jordan Valley, Oregon, and 75 mi southwest of Boise, encompasses 49,470 acres within the Owyhee Mountains of southwest Idaho (fig. 1). Elevations range from about 4,800 ft, where the North Fork of the Owyhee River crosses the western boundary of the study area, to about 6,800 ft along the northeastern boundary. South Mountain (7,850 ft), located 5 mi northwest of the study area, is the only prominent peak in the immediate vicinity. The rugged, extensively stream-dissected northern part of the study area contrasts greatly with the locally incised tablelands of the southern part. With a depth as great as 400 ft, the gorge of the North Fork of the Owyhee River is the deepest canyon in the study area. All of the other streams in the study area are intermittent, reflecting the semi-arid climate of the region. Juniper trees, low-lying sage and other brush, and seasonal varieties of grasses and wild flowers grow throughout most of the area. The larger stream channels support a variety of riparian vegetation.

An improved county-maintained gravel road that extends from Jordan Valley, Oregon, to Grand View, Idaho provides the best access to the study area. Several jeep trails branching off this road extend into the study area (fig. 1). The rugged northeastern part of the study area is accessible only by foot, horse, or helicopter.

Previous and Present Investigations

The first published geologic map of the study area region was a reconnaissance map (1:62,500-scale) accompanying the report by Bennett (1976) on the geology and geochemistry of the South Mountain-Juniper Mountain area. The only other geologic map covering the area is that of Owyhee County by Ekren and others (1981; 1:125,000-scale).

The U.S. Geological Survey conducted field studies in the study area during 1984 and 1985. These studies included geologic mapping and collection of rock samples for petrographic studies. In addition, a geologic reconnaissance of the region surrounding the study area was conducted as an aid to formulating ore-deposit models. Linear features that appeared in Landsat multispectral-scanner images were mapped by photogeologic interpretation for the region. Geochemical data used in making mineral-resource evaluations in this report include stream-sediment data obtained from both Bennett (1976) and a U.S. Department of Energy National Uranium Resource Evaluation (NURE) report (Oak Ridge Gaseous Diffusion Plant, 1982).

U.S. Bureau of Mines personnel conducted a library search of Owyhee County, state, and U.S. Bureau of Land Management mining-production and mineral-lease records for information on mines, prospects, and claims within the study area. A ground and air reconnaissance was undertaken to check for undocumented mining activity. The Bureau of Mines conducted field studies during 1984. Rock and stream-sediment samples were collected to help evaluate the mineral resources of the study area. Complete analytical data are on file at the U.S. Bureau of Mines, Western Field Operations Center, Spokane, Washington, 99202.

APPRAISAL OF IDENTIFIED RESOURCES

By Andrew M. Leszcykowski, U.S. Bureau of Mines

History and Production

There are no known mines, prospects, claims, or mineral leases in the wilderness study area. There are, however, two mining districts nearby. The South Mountain district is located 7 mi northwest of the study area near South Mountain (fig. 1). Silver-lead-zinc ore was produced there intermittently from the early 1870's (Sorenson, 1927) to 1945. The ore occurs as replacement-vein and skarn deposits in limestone (Beaver, 1984). The Silver City mining district, located 24 mi north of the study area (fig. 1), has been active since 1863, most recently at the Delamar open-pit mine, a large-tonnage, low-grade, gold and silver mine. More than $40 million of gold and silver (derived from epithermal veins) have been produced in this district.

Four small borrow pits are located along the county road that skirts the southern part of the study area (fig. 2). Material for road metal was extracted from the pits for use on nearby roads.

Mineral Deposits

No mineral deposits have been identified within the wilderness study area. The only identified resource is tabular, blocky basalt suitable for use as

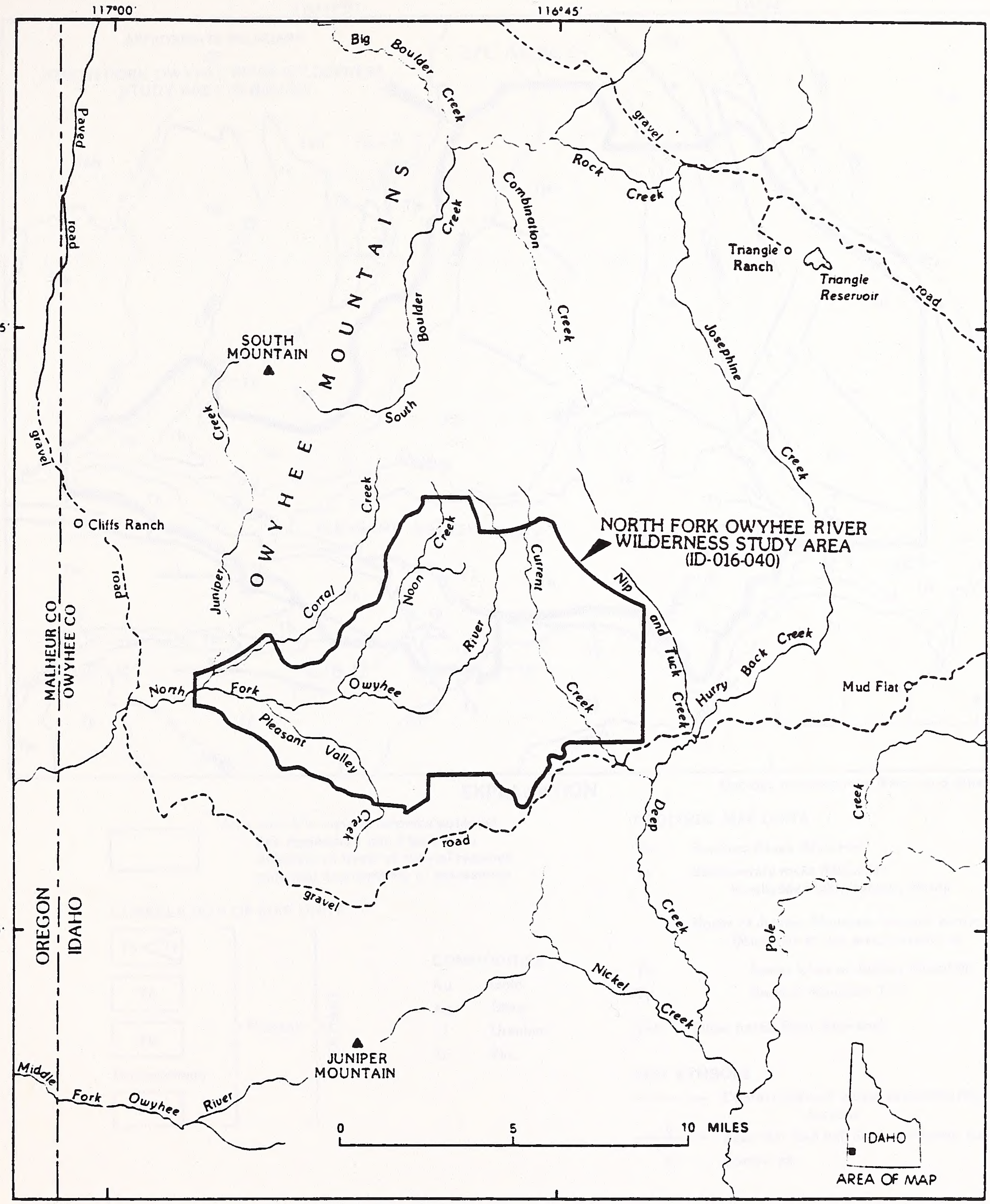
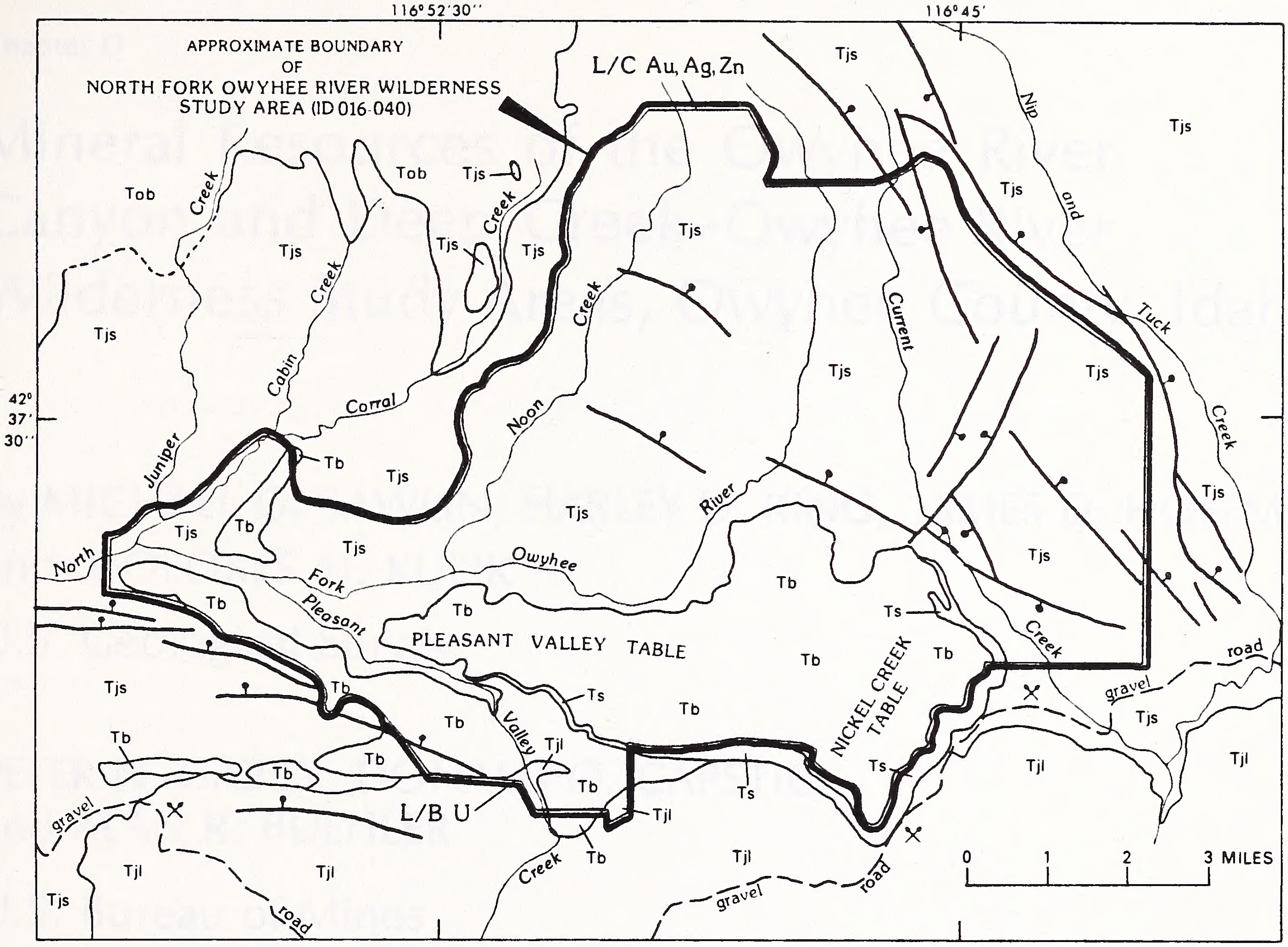


Figure 1. Index map showing location of the North Fork Owyhee River Wilderness Study Area, Owyhee County, Idaho.



Geology modified from Ekren and others (1981)

EXPLANATION

☐ Area with low mineral resource potential. See Appendix 1 and Figure 3 for definition of levels of mineral resource potential and certainty of assessment.

CORRELATION OF MAP UNITS

Tb < Ts
Tjl
Tjs
Unconformity
Tob

Miocene
TERTIARY

COMMODITIES

Au	Gold
Ag	Silver
U	Uranium
Zn	Zinc

GEOLOGIC MAP UNITS

Tb	Banbury Basalt (Miocene)
Ts	Sedimentary rocks (Miocene)--interbedded with Banbury Basalt
	Rocks of Juniper Mountain volcanic center (Miocene)--In this area, consists of:
Tjl	Lower lobes of Juniper Mountain
Tjs	Swisher Mountain Tuff
Tob	Older basalt flows (Miocene)

MAP SYMBOLS

——— - - - Contact-Dashed where approximately located

——•—— Fault-Bar and ball on downthrown side

✕ Borrow pit

Figure 2. Map showing mineral resource potential of the North Fork Owyhee River Wilderness Study Area, Owyhee County, Idaho.

Chapter D

Mineral Resources of the Owyhee River Canyon and Deep Creek–Owyhee River Wilderness Study Areas, Owyhee County, Idaho

By MICHAEL G. SAWLIN, HARLEY D. KING, JAMES D. HOFFMAN, and DOLORES M. KULIK

U.S. Geological Survey

PETER N. GABBY, DONALD O. CAPSTICK, and ALAN R. BUEHLER

U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1719

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
OWYHEE RIVER REGION, IDAHO AND NEVADA

Mineral Resources of the Owyhee River Canyon and Deep Creek–Owyhee River Wilderness Study Areas, Owyhee County, Idaho

By Michael G. Sawlan, Harley D. King, James D. Hoffman, *and* Dolores M. Kulik
U.S. Geological Survey

and Peter N. Gabby, Donald O. Capstick, *and* Alan R. Buehler
U.S. Bureau of Mines

SUMMARY

Abstract

The Owyhee River Canyon Wilderness Study Area (ID-16-48B) and the Deep Creek-Owyhee River Wilderness Study Area (ID-16-49A) are contiguous areas located in the southwest corner of Idaho. At the request of the Bureau of Land Management, 33,700 acres of the Owyhee River Canyon Wilderness Study Area and 67,400 acres of the Deep Creek-Owyhee River Wilderness Study Area were studied. In this report, the areas studied are refered to as the "wilderness study areas," or simply "the study areas." The Owyhee River Canyon Wilderness Study Area extends along the Owyhee River and the South Fork Owyhee River canyons. The Deep Creek-Owyhee River Wilderness Study Area extends along the Owyhee River, and Deep and Dickshooter Creeks. Fieldwork for this report was conducted during 1984 and 1985. Two prospects for lapidary jasper, chalcedony, and common opal are located adjacent to the study areas, and one of these extends into both study areas. These prospects have yielded materials that are mainly of interest to hobbyists. There are no active mines located inside either study area and no mineral resources were identified. A small area in the southwest part of the Deep Creek-Owyhee River Wilderness Study Area has low resource potential for silver. There is no evidence of mineral resources within the Owyhee River Canyon Wilderness Study Area. A diatomite deposit is located within a mile of the northeast margin of the Deep Creek-Owyhee River Wilderness Study Area but has not been mined for over 50 years. Oil and natural gas leases cover parts of both study areas, but no exploration has occurred. Geologic and geophysical evidence for hydrocarbon source beds or structural traps is lacking in both study areas.

Character and Setting

The Owyhee River Canyon Wilderness Study Area and the Deep Creek-Owyhee River Wilderness Study Area are both located in the Owyhee Plateau region in the extreme southwest corner of Idaho (fig. 1). The terrain consists of a flat to rolling plateau into which deep, narrow canyons have been cut by the Owyhee River and its tributaries, Deep Creek and Dickshooter Creek. Canyon depths range from 300 ft in upper Dickshooter Creek to more than 1,000 ft along the Owyhee River at the Oregon-Idaho border. The plateau is underlain by more than 1,000 ft of middle and late Miocene (9-14 million years before present (Ma); see geologic time chart, fig. 3) rhyolite rheoignimbrite (material originally deposited as an ash flow but which flowed in the manner of lava before coming to rest). These volcanic rocks are locally overlain by fluvio-lacustrine sedimentary rocks that may include minor intercalated basalt flows. Basalt flows that have a composite thickness of 20-100 ft form a discontinuous, thin, widespread veneer upon the rhyolites and sedimentary rocks south of the Owyhee River and in the Lambert Table area. Locally abundant, northwest to northeast-trending high-angle faults are most common in the Owyhee River Canyon Wilderness Study Area and the Deep Creek-Owyhee River Wilderness Study Area west of Lambert Table. These faults displace rhyolite and overlying sedimentary rocks but, in most instances, do not displace the mesa-forming basalts.

Mineral Resource Potential of the Owyhee River Canyon Wilderness Study Area

The Owyhee River Canyon Wilderness Study Area exhibits no evidence of the existence of metallic or nonmetallic mineral resources. Available geologic and geophysical data do not suggest the occurrence of hydrocarbon source rocks or structural traps within the

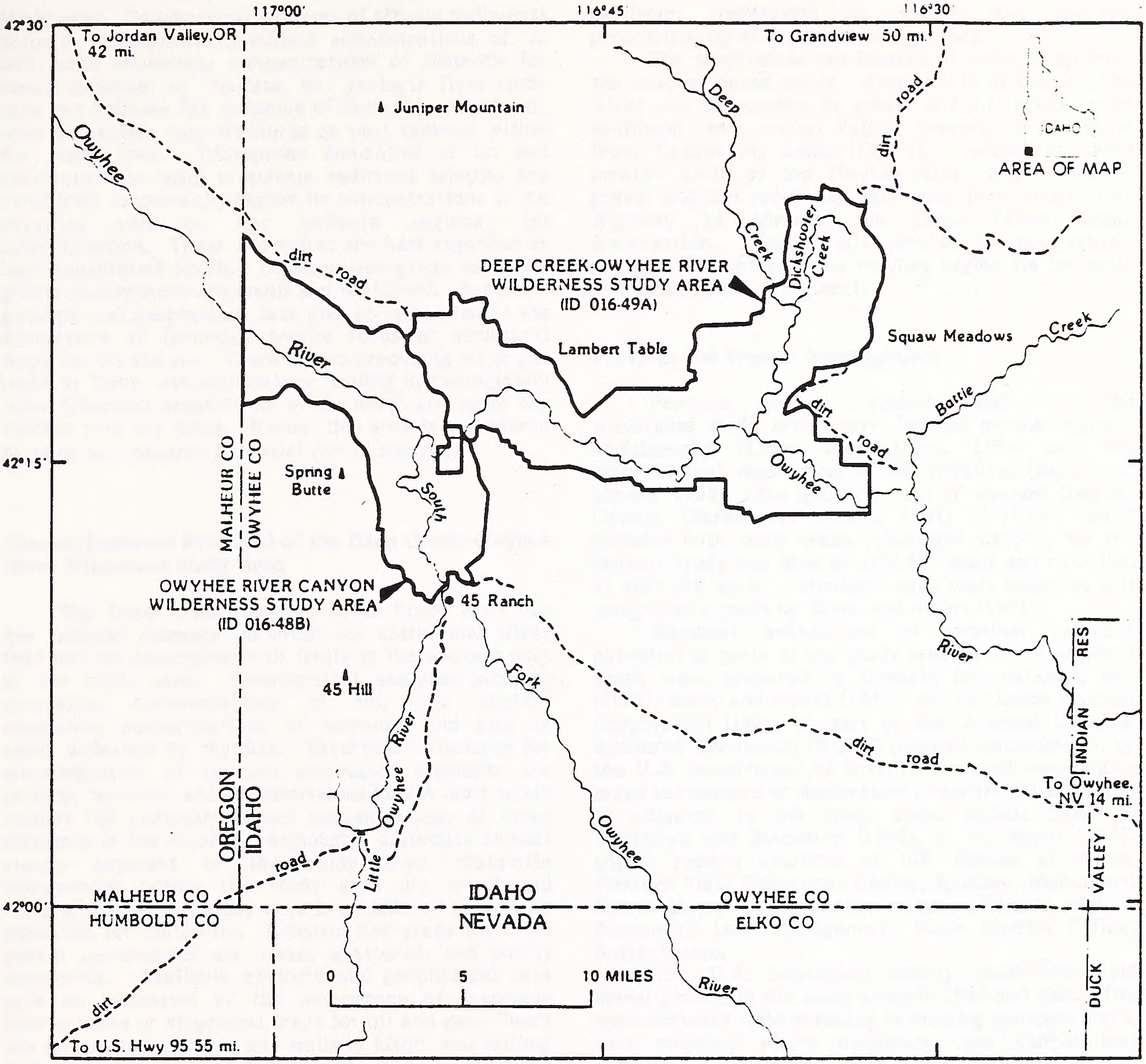


Figure 1. Index map showing location of Owyhee River Canyon and Deep Creek-Owyhee River Wilderness Study Areas, Owyhee County, Idaho.

study area. Geochemical analyses of stream sediments indicate widespread anomalous concentrations of tin and local anomalous concentrations of bismuth for areas underlain by rhyolite, but geologic field study does not indicate the presence of favorable structures, such as caldera ring fractures or vent systems within the study area. Widespread anomalies of tin and associated elements in stream sediment samples are attributed to generally higher tin concentrations in the rhyolites and do not indicate regional tin mineralization. These anomalies are best regarded as high background levels. Construction-grade sand and gravel occurrences are small and scattered. Available geologic and geophysical data give no indication of the occurrence of favorable source rocks or structural traps for oil and gas. There are no producing oil or gas wells in Idaho, and exploratory drilling in geologically more favorable areas 50 mi to the north and south has yielded only dry holes. Hence, this area is considered to have no resource potential for oil and gas.

Mineral Resource Potential of the Deep Creek-Owyhee River Wilderness Study Area

The Deep Creek-Owyhee River Study Area has low mineral resource potential for epithermal silver that may be associated with faults in the western part of the study area. Geochemical analyses indicate anomalous concentrations of tin, and slightly anomalous concentrations of cadmium and zinc in areas underlain by rhyolite. Favorable structures for mineralization of tin and associated elements are lacking, however, and the anomalous values most likely reflect the generally higher concentrations of these elements in the rhyolite. Although a diatomite deposit occurs adjacent to the study area, diatomite occurrences within the study area are small and impure; hence, this study area is considered to have no potential for diatomite. Construction-grade sand and gravel occurrences are small, scattered, and poorly accessible. Available geologic and geophysical data give no indication of the occurrence of favorable source rocks or structural traps for oil and gas. There are no producing oil or gas wells in Idaho, and drilling in geologically more favorable areas 50 mi to the north and south has yielded only dry holes. Hence, this area is considered to have no resource potential for oil and gas.

INTRODUCTION

Area Description

The Owyhee River Canyon Wilderness Study Area (ID-16-48B) includes 33,700 acres, and the Deep Creek-Owyhee River Wilderness Study Area (ID-16-49A) includes 67,400 acres. Both study areas are in the flat to gently rolling Owyhee Plateau of southwestern Idaho and have average elevations of about 5,000 ft. In the study areas, spectacular canyons as much as 1,000 ft deep have been cut into the plateau by the Owyhee River and its tributaries, Deep Creek and Dickshooter Creek. The climate is arid to semiarid; vegetation is sparse and consists predominantly of sagebrush and grasses.

The study areas are located at least 40 mi from the nearest paved roads. Areas north of the Owyhee River can be reached by gravel and dirt roads either southeast from Jordan Valley, Oregon, or southwest from Grandview, Idaho (fig. 1). Access to areas located south of the Owyhee River is provided by gravel and dirt roads that lead west from Idaho State Highway 51 through the Duck Valley Indian Reservation. Jeep trails provide limited vehicle access after entering the Owyhee region via the main dirt roads shown in figure 1.

Previous and Present Investigations

Previous geologic studies related to the wilderness study areas have focused on the regional stratigraphy (Ekren and others, 1984) and the emplacement mechanism of the rhyolites (Ekren and others, 1982). The geologic map of western Owyhee County (Ekren and others, 1981; 1:125,000 scale) includes both study areas. Geologic mapping for the present study was done at 1:24,000 scale and compiled at 1:62,500 scale. Lithologic units were based on unit assignments made by Ekren and others (1981).

Regional evaluations of uranium resource potential in parts of the study areas and (or) adjacent areas were prepared by Geodata International, Inc. (1980), Berry and others (1982), and the Union Carbide Corporation (1982) as part of the National Uranium Resource Evaluation (NURE) program administered by the U.S. Department of Energy. Previous nonspecific mineral-resource or exploration geochemical studies in or adjacent to the study areas include those of Matthews and Blackburn (1983), R. W. Morris (1976, unpub. report; available at U.S. Bureau of Mines, Western Field Operations Center, Spokane, Wash.), and Gloria Derby (1981, unpub. report; available at U.S. Bureau of Land Management, Boise District Office, Boise, Idaho).

The U.S. Geological Survey conducted field investigations in the study areas in 1984 and 1985. The work included field checking of existing geologic maps, new mapping where necessary, and geochemical sampling. Analytical data were obtained for 45 stream-sediment samples and 39 nonmagnetic, heavy-mineral panned concentrates from the Owyhee River Canyon area, and 70 stream-sediment samples and 59 nonmagnetic, heavy-mineral, panned concentrates from the Deep Creek-Owyhee River area.

The U.S. Bureau of Mines conducted a library search for information on mines and prospects within the wilderness study areas. These data were supplemented by information from Owyhee County and U.S. Bureau of Land Management mining and mineral-lease records and by U.S. Bureau of Mines and State production records. Field studies were conducted in 1984 for both the Owyhee Canyon Wilderness Study Area (Gabby, 1985) and the Deep Creek-Owyhee River Wilderness Study Area (Capstick and Buehler, 1985). Prospects and claims near the study areas were studied to determine if mineralized zones extend into the study areas and to establish guides to mineral deposits in the region. Reconnaissance panned-concentrate

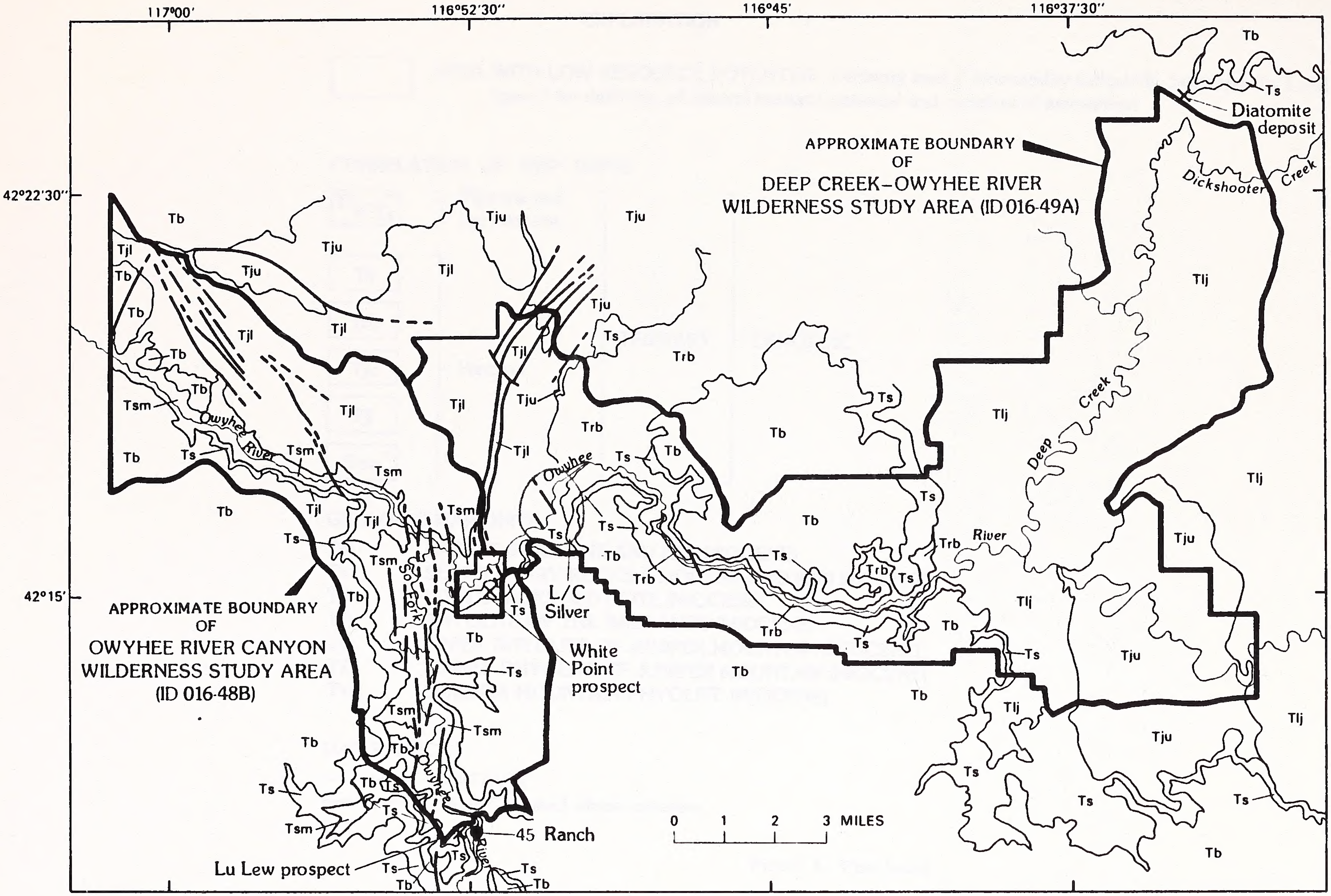
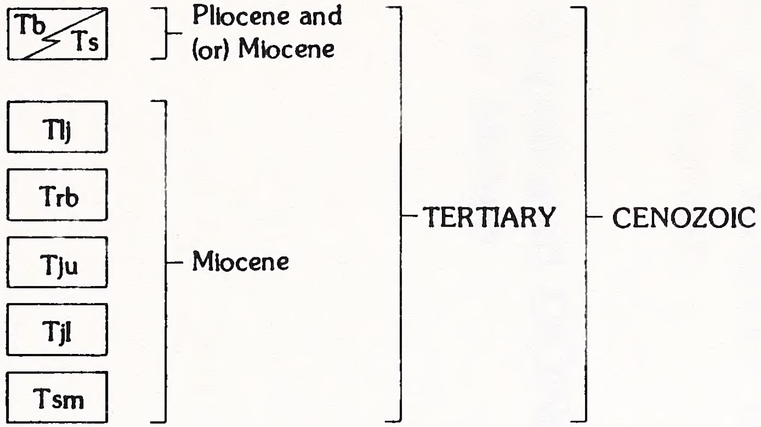


Figure 2. Map showing mineral resource potential and geology of the Owyhee River Canyon and the Deep Creek-Owyhee River Wilderness Study Areas, Owyhee County, Idaho.

EXPLANATION

☐ AREA WITH LOW RESOURCE POTENTIAL-Certainty level C (commodity indicated). See appendix 1 and figure 3 for definition of mineral resource potential and certainty of assessment

CORRELATION OF MAP UNITS



GEOLOGIC MAP UNITS

Tb	BASALT (PLIOCENE AND (OR) MIOCENE)
Ts	SEDIMENTARY ROCKS (PLIOCENE AND (OR) MIOCENE)
Tlj	LITTLE JACKS RHYOLITE (MIOCENE)
Trb	RHYOLITE OF THE BADLANDS (MIOCENE)
Tju	UPPER RHYOLITE OF JUNIPER MOUNTAIN (MIOCENE)
Tjl	LOWER RHYOLITE OF JUNIPER MOUNTAIN (MIOCENE)
Tsm	SWISHER MOUNTAIN RHYOLITE (MIOCENE)

MAP SYMBOLS

——— CONTACT

——- - - FAULT-Dashed where uncertain

Figure 2. Continued

Chapter C

Mineral Resources of the Little Owyhee River Wilderness Study Area, Owyhee County, Idaho

By JAY A. ACH and HARLEY D. KING
U.S. Geological Survey

ALAN R. BUEHLER and DONALD O. CAPSTICK
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1719-C

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
OWYHEE RIVER REGION, IDAHO AND NEVADA

Mineral Resources of the Little Owyhee River Wilderness Study Area, Owyhee County, Idaho

By Jay A. Ach and Harley D. King
U.S. Geological Survey

Alan R. Buehler and Donald O. Capstick
U.S. Bureau of Mines

SUMMARY

Abstract

The Little Owyhee River Wilderness Study Area (ID-016-48C) encompasses 8,460 acres in the extreme southwest corner of Idaho along the canyon of the Little Owyhee River. Throughout this report, "wilderness study area" and "study area" refer to the 8,460 acres on which mineral surveys were completed. Fieldwork for this report was carried out between 1983 and 1985. No mines, prospects, or mining claims were located inside the study area, and no mineral resources were identified. The wilderness study area has a low mineral resource potential for silver, gold, and mercury. There is also a low mineral resource potential for the nonmetallic commodities diatomite and zeolites.

Character and Setting

The Little Owyhee River Wildernesss Study Area is located 8 mi northeast of the southwest corner of Idaho (fig. 1). The terrain consists of a flat to gently rolling plateau deeply incised by the spectacular canyon cut by the Little Owyhee River to depths of 800 ft. The surface of the plateau is defined by the thin flows of the Banbury Basalt of late Miocene age. Beneath surficial flows, additional basalt flows are interbedded with lacustrine sediments. The Banbury Basalt and lacustrine sediments overlie the Swisher Mountain Tuff, a rhyolitic ash-flow tuff of middle Miocene age. The Swisher Mountain Tuff is the oldest unit exposed in the study area. (See Ekren and others, 1981, 1984.)

Identified Resources

No known mines, prospects, or mining claims are located within the study area, but parts of the study area are included in petroleum and natural gas leases or lease applications. There are no identified mineral or energy resources within the study area.

Mineral Resource Potential

The Little Owyhee River Wilderness Study Area does not lie within any established mining district.

The northeastern part of the wilderness study area has low mineral resource potential for both epithermal silver-gold and epithermal mercury deposits. This is indicated by weak geochemical anomalies in rock samples from within the study area and the presence of small areas of altered rock and additional geochemical anomalies immediately outside the study area.

Some geochemical evidence of the presence of tin was gathered to the west of the study area, although the geologic environment is not favorable for a tin resource in that area. However, no geochemical evidence of tin was found within the study area and the wilderness study area is considered to have no mineral resource potential for tin.

The mineral resource potential for the nonmetallic commodities diatomite and zeolites is also considered low in the wilderness study area. Evidence of the occurrence of these minerals exists 1-1.5 mi outside the study area in sedimentary rocks, but little evidence of their existence within the study area was found.

INTRODUCTION

Area Description

The Little Owyhee River Wilderness Study Area (ID-016-48C) consists of 8,460 acres recommended suitable for wilderness consideration out of 24,677 acres originally considered. The study area is located 8 mi northeast of the southwestern corner of Idaho

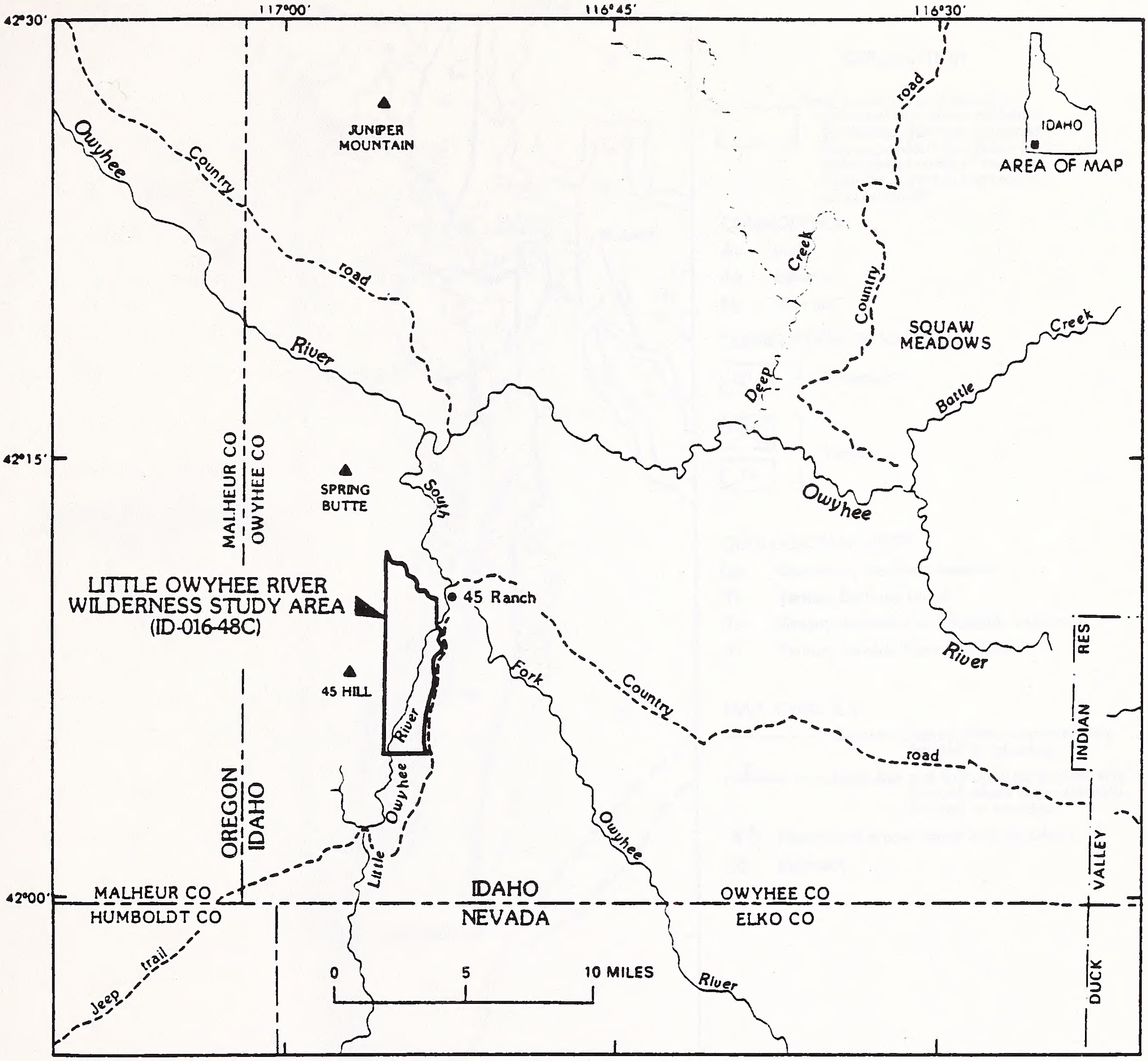


Figure 1. Index map showing location of the Little Owyhee River Wilderness Study Area, Owyhee County, Idaho.

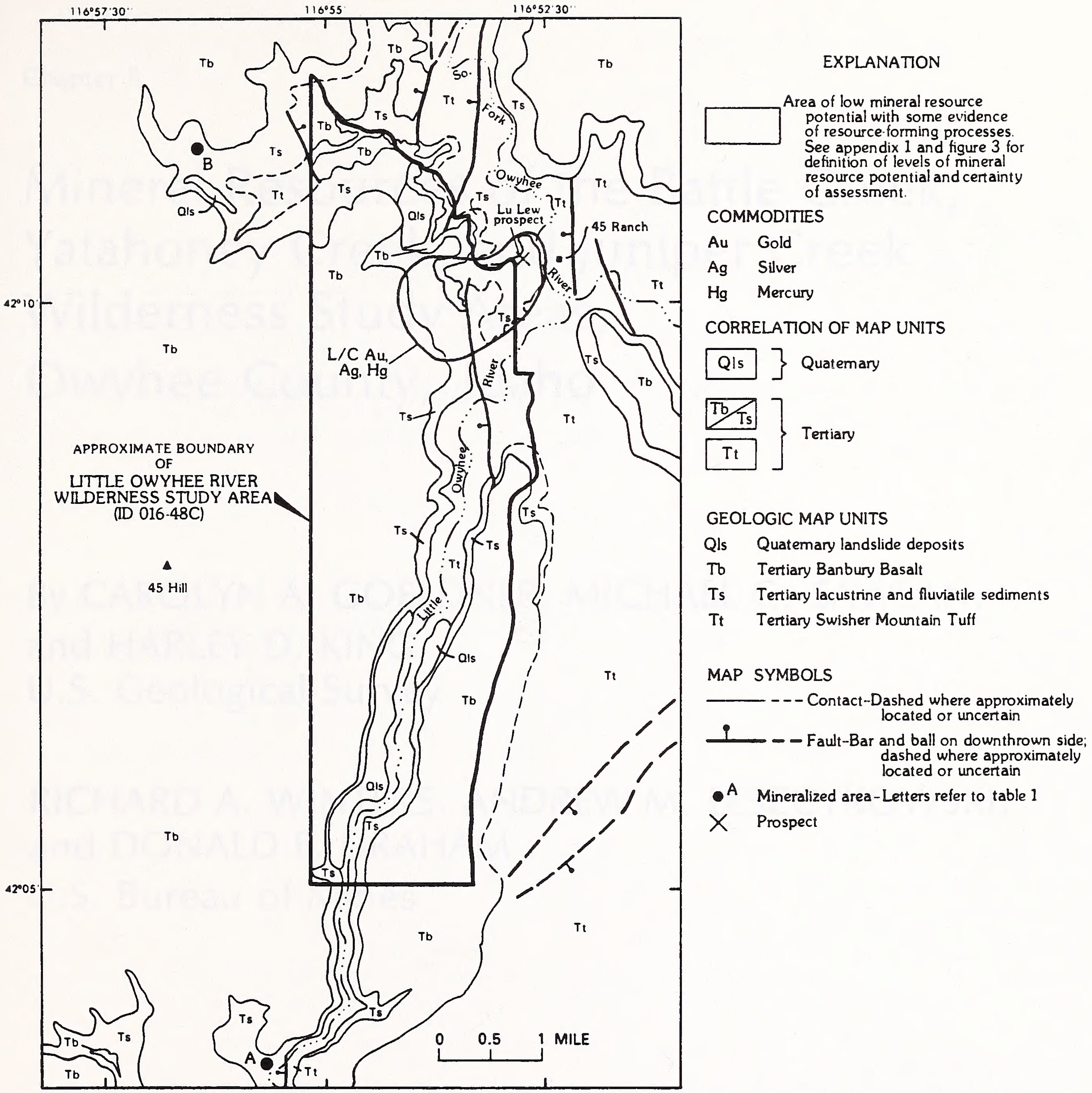

116°57'30"
116°55'
116°52'30"
42°10'
42°05'
Tb
Ts
Tt
Qls
B
A
So. Fork Owyhee River
Lu Lew prospect
45 Ranch
L/C Au, Ag, Hg
Little Owyhee River
APPROXIMATE BOUNDARY OF LITTLE OWYHEE RIVER WILDERNESS STUDY AREA (ID 016-48C)
45 Hill
0 0.5 1 MILE
EXPLANATION
Area of low mineral resource potential with some evidence of resource-forming processes. See appendix 1 and figure 3 for definition of levels of mineral resource potential and certainty of assessment.
COMMODITIES
Au Gold
Ag Silver
Hg Mercury
CORRELATION OF MAP UNITS
Qls Quaternary
Tb/Ts Tt Tertiary
GEOLOGIC MAP UNITS
Qls Quaternary landslide deposits
Tb Tertiary Banbury Basalt
Ts Tertiary lacustrine and fluviatile sediments
Tt Tertiary Swisher Mountain Tuff
MAP SYMBOLS
Contact-Dashed where approximately located or uncertain
Fault-Bar and ball on downthrown side; dashed where approximately located or uncertain
A Mineralized area-Letters refer to table 1
Prospect

Figure 2. Map showing mineral resource potential and geology of the Little Owyhee River Wilderness Study Area, Owyhee County, Idaho.

Chapter B

Mineral Resources of the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho

By CAROLYN A. GOELDNER, MICHAEL G. SAWLAN,
and HARLEY D. KING
U.S. Geological Survey

RICHARD A. WINTERS, ANDREW M. LESZCYKOWSKI,
and DONALD E. GRAHAM
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1719–B

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
OWYHEE RIVER REGION, IDAHO AND NEVADA

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
OWYHEE RIVER REGION, IDAHO AND NEVADA

Mineral Resources of the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho

By Carolyn A. Goeldner, Michael G. Sawlan, *and* Harley D. King
U.S. Geological Survey

Richard A. Winters, Andrew M. Leszcykowski, *and* Donald E. Graham
U.S. Bureau of Mines

SUMMARY

Abstract

The parts of the three wilderness study areas included in this report and for which mineral surveys were requested, Battle Creek (ID-016-49E), Yatahoney Creek (ID-016-49D), and Juniper Creek (ID-016-52), encompass 31,880 acres, 9,550 acres, and 12,350 acres, respectively, in southwestern Idaho. In this report, the areas studied are referred to as "the wilderness study areas," or simply "the study areas." Field work for this report was carried out by the U.S. Bureau of Mines and U.S. Geological Survey in 1984 and 1985. The three study areas contain no known mines, claims, or prospects. They are covered by natural gas leases or lease applications, but no exploration has occurred. On the basis of geologic studies, geochemical and geophysical evidence, and mineral surveys, these wilderness study areas are defined as having low mineral resource potential for gold, silver, lead, tin, and diatomite. In this report, any references to the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas refer only to those parts of the wilderness study areas for which the Bureau of Land Management requested mineral surveys.

Character and Setting

The Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas lie along the Owyhee River and its tributaries in extreme southwestern Idaho (fig. 1). All three study areas are located in the Owyhee Plateau subprovince of the Columbia Intermontane geologic province, informally known as the Owyhee volcanic field (Pansze, 1975). Elevation ranges from 4,609 ft on the Owyhee River near Wiley Ranch in the Yatahoney Creek Wilderness Study Area to 5,651 ft in the northern part of the Battle Creek Wilderness Study Area. Plateau topography characterizes the intercanyon areas, although, within the study areas, relief is as much as 500 ft along the Owyhee River and Battle Creek.

The stratigraphy of the three areas comprises horizontal, laterally extensive Miocene (about 14 to 10 million years before present, or Ma) rhyolitic rocks locally overlain by Miocene sedimentary rocks and Miocene and (or) Pliocene(5 to 2 Ma) basalt (fig. 2) (see Geologic Time Chart, last page of report). In the Battle Creek Wilderness Study Area, sedimentary rocks and basalt occur mostly southeast of Battle Creek. Northwest-trending en echelon normal faults with vertical displacements of 20-100 ft occur primarily southeast of Battle Creek (fig. 2).

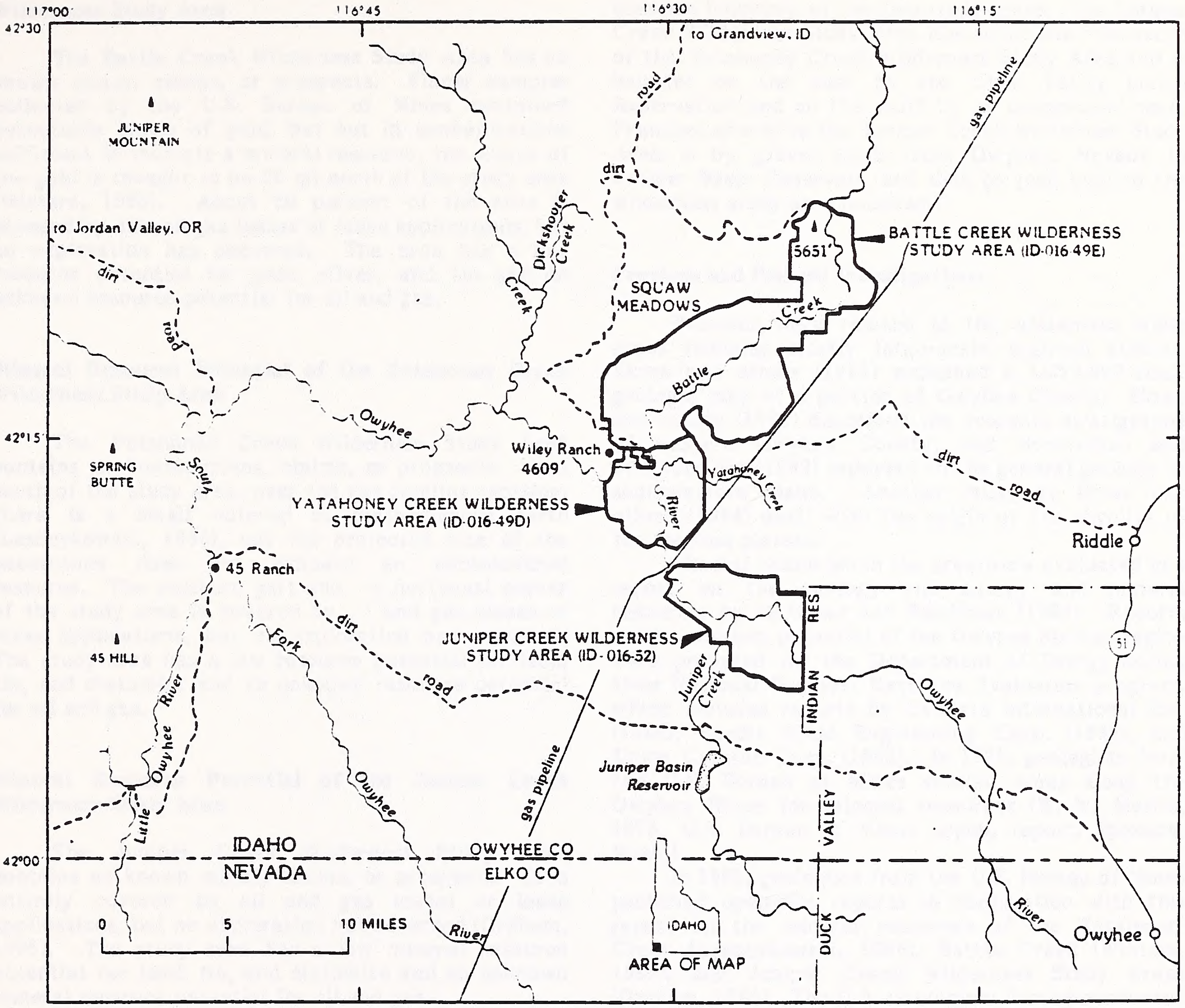


Figure 1. Index map showing the locations of the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho.

Mineral Resource Potential of the Battle Creek Wilderness Study Area

The Battle Creek Wilderness Study Area has no known mines, claims, or prospects. Placer samples collected by the U.S. Bureau of Mines contained detectable levels of gold, but not in concentrations sufficient to indicate a mineral resource; the source of the gold is thought to be 20 mi north of the study area (Winters, 1985). About 50 percent of the area is covered by oil and gas leases or lease applications, but no exploration has occurred. The area has a low resource potential for gold, silver, and tin and an unknown resource potential for oil and gas.

Mineral Resource Potential of the Yatahoney Creek Wilderness Study Area

The Yatahoney Creek Wilderness Study Area contains no known mines, claims, or prospects. Just south of the study area, near the gas pipeline crossing, there is a small outcrop of diatomaceous earth (Leszcykowski, 1986), but the projected size of the occurrence does not indicate an undiscovered resource. The southern part and the northeast corner of the study area is covered by oil and gas leases or lease applications, but no exploration has occurred. The study area has a low resource potential for lead, tin, and diatomite and an unknown resource potential for oil and gas.

Mineral Resource Potential of the Juniper Creek Wilderness Study Area

The Juniper Creek Wilderness Study Area contains no known mines, claims, or prospects. It is entirely covered by oil and gas leases or lease applications, but no exploration has occurred (Graham, 1985). The study area has a low mineral resource potential for lead, tin, and diatomite and an unknown mineral resource potential for oil and gas.

INTRODUCTION

Area Description

The Battle Creek (ID-016-49E), Yatahoney Creek (ID-016-49D), and Juniper Creek (ID-016-52) Wilderness Study Areas as a whole include 54,180 acres located along the Owyhee River and its tributaries in extreme southwestern Idaho. The Battle Creek and Yatahoney Creek Wilderness Study Areas are contiguous, but a narrow gas-pipeline corridor separates the Juniper Creek and Yatahoney Creek Wilderness Study Areas. The study areas are characterized by flat plateaus, except along the stream courses where the waters have incised nearly vertical canyons as deep as 500 ft.

Access to the Battle Creek Wilderness Study Area is by graded dirt roads and unimproved roads suitable only for four-wheel-drive vehicles. The Yatahoney Creek Wilderness Study Area is contiguous with the southern boundary of the Battle Creek Wilderness Study Area, and a jeep trail marks the common boundary of the two study areas. The Juniper Creek Wilderness Study Area lies about one mile south of the Yatahoney Creek Wilderness Study Area and is bounded on the east by the Duck Valley Indian Reservation and on the south by an unimproved road. Principal access to the Juniper Creek Wilderness Study Area is by gravel roads from Owyhee, Nevada to Juniper Basin Reservoir, and then by jeep trail to the wilderness study area boundary.

Previous and Present Investigations

Previous work related to the wilderness study areas includes mostly large-scale regional studies. Ekren and others (1981) published a 1:250,000-scale geologic map of a portion of Owyhee County. Ekren and others (1982) described the volcanic stratigraphy of western Owyhee County, and Bonnischen and Breckenridge (1982) reported on the general geology of southwestern Idaho. Another study by Ekren and others (1984) dealt with the origin of the rhyolite of the Owyhee plateau.

Mineral resources in the area were evaluated in a report on the geology and energy and mineral resources by Mathews and Blackburn (1983). Reports on the uranium potential of the Owyhee plateau region were prepared for the Department of Energy during their National Uranium Resource Evaluation program, which includes reports by Geodata International Inc. (1980), Bendix Field Engineering Corp. (1982), and Union Carbide Corp. (1982). In 1976, geologists from the U.S. Bureau of Mines studied areas along the Owyhee River for mineral resources (R. W. Morris, 1976, U.S. Bureau of Mines unpub. report, Spokane, Wash.).

In 1985, geologists from the U.S. Bureau of Mines published open-file reports in conjunction with this report on the mineral resources of the Yatahoney Creek (Leszcykowski, 1986), Battle Creek (Winters, 1985), and Juniper Creek Wilderness Study Areas (Graham, 1985). The U.S. Geological Survey conducted field investigations in the three wilderness study areas during 1984 and 1985. The work included field checking of existing geologic maps, new mapping where necessary, and geochemical sampling.

Appraisal of Identified Resources

By Richard A. Winters, Andrew M.
Leszcykowski, and Donald E. Graham
U. S.Bureau of Mines

No mining or commercial mineral exploration has occurred in any of the wilderness study areas. In the Battle Creek Wilderness Study Area, 6 of 12 placer samples contained subeconomic but detectable concentrations of gold (Winters, 1985). Each sample had a gold value of less than $\$0.02/\text{yd}^3$ (price of gold calculated at $400.00/troy ounce), whereas $\$0.10\text{-}0.15/\text{yd}^3$ is considered anomalous, and $\$8\text{-}10/\text{yd}^3$ is marginally economic. The source of the gold is assumed to be about 20 mi north of the wilderness study area (Winters, 1985), where the headwaters of

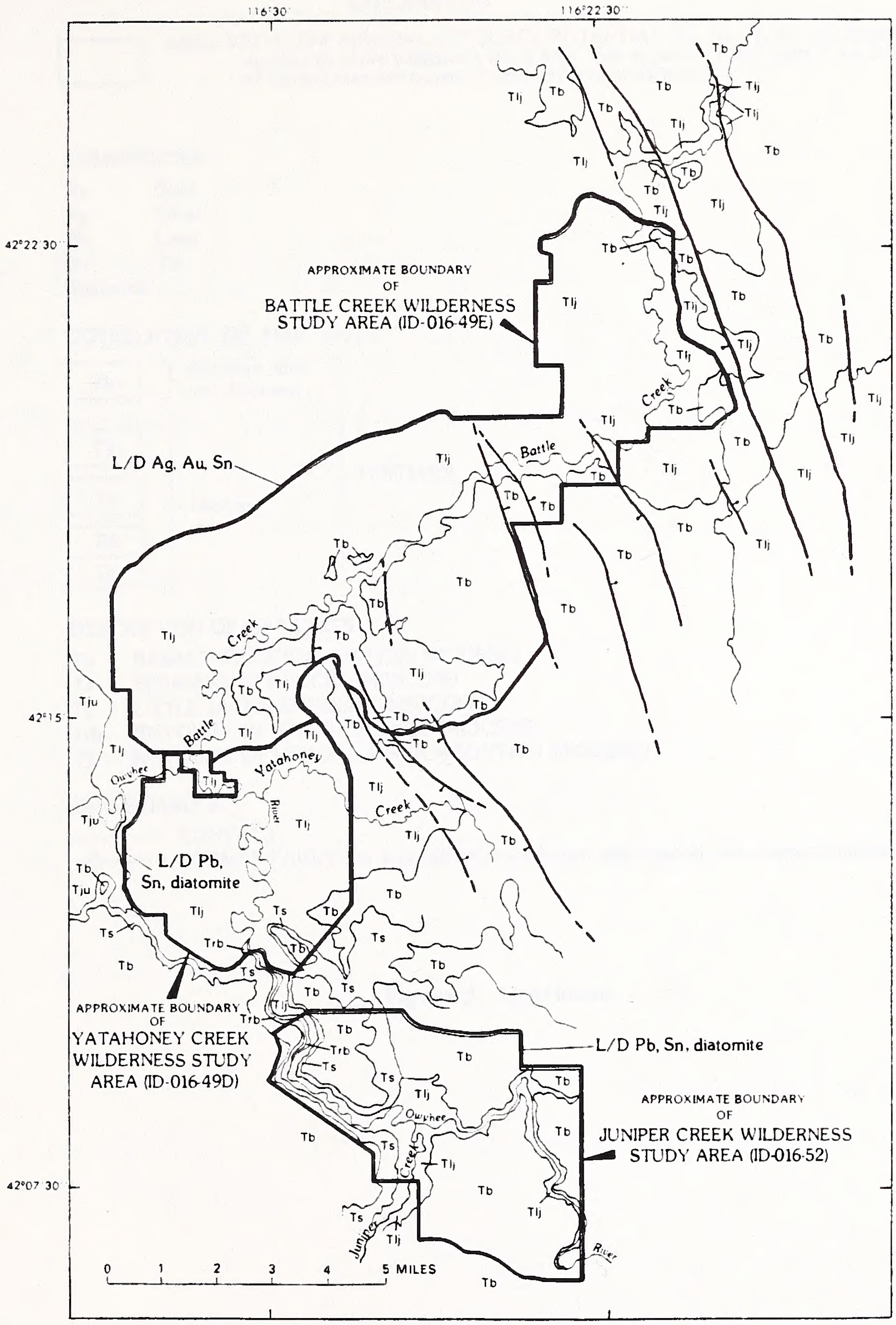

116°30'
116°22'30"
42°22'30"
42°15'
42°07'30"
APPROXIMATE BOUNDARY OF BATTLE CREEK WILDERNESS STUDY AREA (ID-016-49E)
L/D Ag, Au, Sn
L/D Pb, Sn, diatomite
APPROXIMATE BOUNDARY OF YATAHONEY CREEK WILDERNESS STUDY AREA (ID-016-49D)
L/D Pb, Sn, diatomite
APPROXIMATE BOUNDARY OF JUNIPER CREEK WILDERNESS STUDY AREA (ID-016-52)
Battle Creek
Yatahoney Creek
Owyhee River
Juniper Creek
Tb
Tlj
Tju
Ts
Trb
0 1 2 3 4 5 MILES

Figure 2. Map showing geology and mineral resource potential of the Battle Creek, Yatahoney Creek and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho.

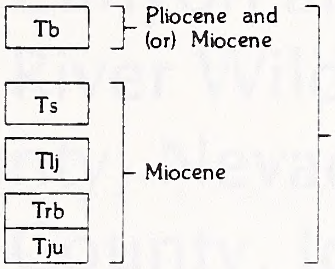
EXPLANATION

☐ AREA WITH LOW MINERAL RESOURCE POTENTIAL--Au, Ag, Pb, Sn, and diatomite. Applies to entire wilderness study area. See appendix 1 and figure 3 for definition of mineral resource potential and certainty of assessment

COMMODITIES

Au	Gold
Ag	Silver
Pb	Lead
Sn	Tin
Diatomite	

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Tb	BASALT (PLIOCENE AND (OR) MIOCENE)
Ts	SEDIMENTARY ROCKS (MIOCENE)
Tlj	LITTLE JACKS RHYOLITE (MIOCENE)
Trb	RHYOLITE OF THE BADLANDS (MIOCENE)
Tju	RHYOLITE OF UPPER JUNIPER MOUNTAIN (MIOCENE)

MAP SYMBOLS

——— CONTACT

—┸— - - - NORMAL FAULT-Bar and ball on downthrown side; dashed where approximately located

Figure 2. Continued.

Chapter F

Mineral Resources of the Owyhee Canyon and South Fork Owyhee River Wilderness Study Areas, Elko County, Nevada, and Owyhee County, Idaho

By EUGENE E. FOORD, MICHAEL J. LUESSEN,
DIRK S. HOVORKA, JOSEPH L. PLESHA,
V.J.S. GRAUCH, HARLAN BARTON, and
HARLEY D. KING
U.S. Geological Survey

DONALD O. CAPSTICK, RONALD T. MAYERLE,
ALAN R. BUEHLER, and PETER N. GABBY
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1719

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
OWYHEE RIVER REGION, IDAHO AND NEVADA

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
OWYHEE RIVER REGION, IDAHO AND NEVADA

Mineral Resources of the Owyhee Canyon and South Fork Owyhee River Wilderness Study Areas, Elko County, Nevada, and Owyhee County, Idaho

By Eugene E. Foord, Michael J. Luessen, Dirk S. Hovorka, Joseph L. Plesha,
V.J.S. Grauch, Harlan Barton, *and* Harley D. King
U.S. Geological Survey

Donald O. Capstick, Ronald T. Mayerle, Alan R. Buehler, *and* Peter N. Gabby
U.S. Bureau of Mines

SUMMARY

Three U.S. Bureau of Land Management (BLM) wilderness study areas comprise approximately 61,135 acres of Tertiary volcanic rocks exposed along the South Fork of the Owyhee River in northeastern Nevada and southwestern Idaho. From south to north, the Owyhee Canyon (NV–010–106, 13,525 acres)[1] and South Fork Owyhee River (Nevada part, NV–010–103A, 5,180 acres, and Idaho part, ID–016–053, 42,430 acres) Wilderness Study Areas extend for 38 mi (miles) through Elko County, Nev., and Owyhee County, Idaho (fig. 1). The southern tip of the study region (the area including all three study areas) is about 40 mi west of Mountain City, Nev., and approximately 60 mi east of McDermitt, Nev. Joint mineral resource studies of the wilderness study areas were done in 1984–85 by the U.S. Geological Survey (USGS) and the U.S. Bureau of Mines (USBM). The USGS studied the total acreage of the three study areas, that is, 21,875 acres of Owyhee Canyon (NV–010–106), 7,842 acres of South Fork Owyhee River (NV–010–103A), and 42,510 acres of South Fork Owyhee River (ID–016–053). This report, however, presents only the joint results of surveys by the USGS and the USBM on the lesser acreages mentioned previously. The studies showed that all three areas have low potential for undiscovered resources of all metals and nonmetals, oil, gas, coal, and geothermal energy (fig. 2). There are no identified resources in any of the wilderness study areas.

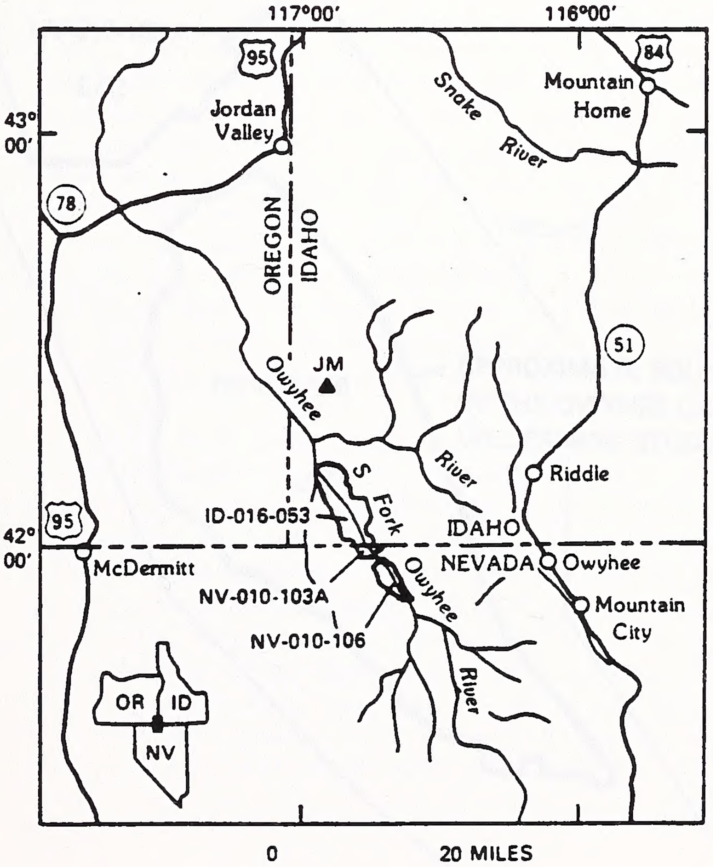


Figure 1. Index map showing location of the Owyhee Canyon (NV-010–106), and South Fork Owyhee River (Nevada part, NV-010–103A; Idaho part, ID-016–053) Wilderness Study Areas. JM, Juniper Mountain volcanic center of Ekren and others (1984) (modified from Kuntz and others, 1986).

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[1] The Owyhee Canyon Wilderness Study Area described in this report is distinct from the Owyhee Canyon Wilderness Study Area in Oregon (OR–003–195), which is described in Bulletin 1719–E in this volume.

Mineral Resources of the Owyhee Canyon and South Fork Owyhee River Wilderness Study Areas, Elko County, Nevada, and Owyhee County, Idaho

By Eugene E. Foord, [illegible] [illegible], [illegible] [illegible], Joseph L. Plesha,
V.J.S. Grauch, Harlan Barton, and Harley D. King
U.S. Geological Survey

Donald O. Capstick, [illegible] [illegible], Alan R. Buehler, and Peter N. Gabby
U.S. Bureau of Mines

Figure 1. [illegible]

SUMMARY

[illegible] the Owyhee Canyon [illegible] South Fork [illegible] Owyhee River [illegible] Nevada and south-western Idaho. [illegible] Elko County, Nev., and Owyhee County, Idaho (fig. 1). [illegible] U.S. Geological Survey (USGS) and the U.S. Bureau of Mines (USBM). [illegible] by the USGS and the USBM [illegible] of the wilderness study areas.

[illegible]

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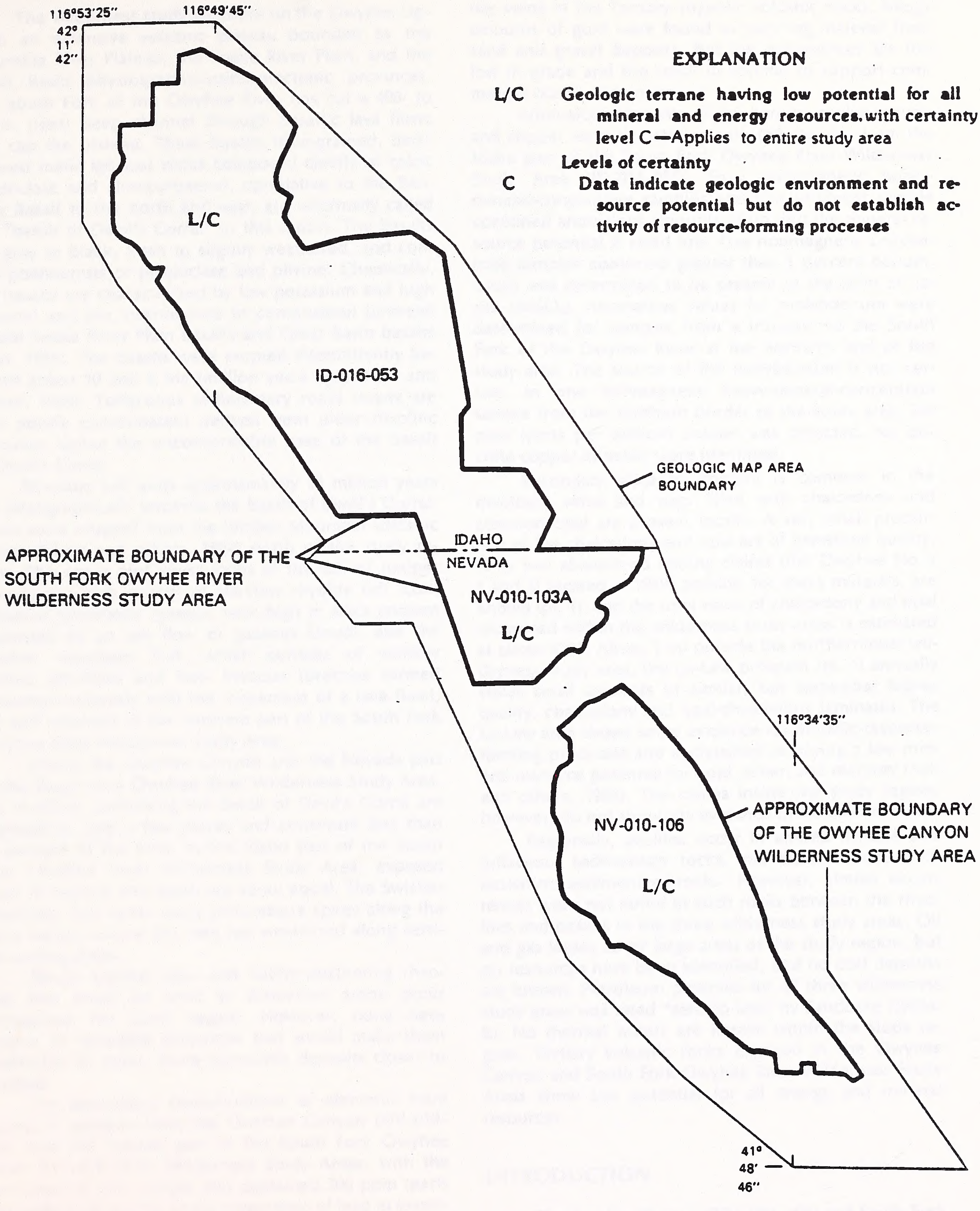
116°53'25"
116°49'45"
42°
11'
42"
EXPLANATION
L/C Geologic terrane having low potential for all mineral and energy resources with certainty level C—Applies to entire study area
Levels of certainty
C Data indicate geologic environment and resource potential but do not establish activity of resource-forming processes
L/C
ID-016-053
GEOLOGIC MAP AREA BOUNDARY
IDAHO
NEVADA
APPROXIMATE BOUNDARY OF THE SOUTH FORK OWYHEE RIVER WILDERNESS STUDY AREA
NV-010-103A
L/C
116°34'35"
APPROXIMATE BOUNDARY OF THE OWYHEE CANYON WILDERNESS STUDY AREA
NV-010-106
L/C
41°
48'
46"

Figure 2. Mineral resource potential map of the Owyhee Canyon and South Fork Owyhee River Wilderness Study Areas (NV-010-106, NV-010-103A, and ID-016-053). No geologic terrane having high or moderate resource potential for any commodity was identified by this study.

The wilderness study areas are on the Owyhee Upland, an extensive volcanic plateau bounded by the Columbia River Plateau, the Snake River Plain, and the Great Basin physiographic-volcanotectonic provinces. The South Fork of the Owyhee River has cut a 400- to 800-ft- (feet) deep channel through basaltic lava flows that cap the plateau. These basalts (fine-grained, dark-colored mafic igneous rocks composed chiefly of calcic plagioclase and clinopyroxene), correlative to the Banbury Basalt to the north and east, are informally called the "basalt of Devil's Corral" in this report. The basalts are gray to black, fresh to slightly weathered, and contain phenocrysts of plagioclase and olivine. Chemically, the basalts are characterized by low potassium and high titanium and are intermediate in composition between typical Snake River Plain basalts and Great Basin basalts (Hart, 1985). The basalts were erupted intermittently between about 10 and 6 Ma (million years ago) (Hart and others, 1984). Tuffaceous sedimentary rocks (many are very poorly consolidated) derived from older rhyolitic volcanics define the unconformable base of the basalt of Devil's Corral.

Rhyolitic tuff units approximately 14 million years old stratigraphically underlie the basalt of Devil's Corral. These were erupted from the Juniper Mountain volcanic center (Ekren and others, 1984) north of the study region. The upper and lower lobes of the tuff of Juniper Mountain, which consist of ash-flow rhyolite tuff (consolidated pyroclastic igneous rock high in silica content deposited by an ash flow or gaseous cloud), and the Swisher Mountain Tuff, which consists of variably welded ash-flows and flow breccias (breccias formed contemporaneously with the movement of a lava-flow), are well exposed in the northern part of the South Fork Owyhee River Wilderness Study Area.

Within the Owyhee Canyon and the Nevada part of the South Fork Owyhee River Wilderness Study Area, the rhyolites underlying the basalt of Devil's Corral are exposed in only a few places and constitute less than 10 percent of the area. In the Idaho part of the South Fork Owyhee River Wilderness Study Area, exposed areas of rhyolite and basalt are about equal. The Swisher Mountain Tuff forms many picturesque spires along the inner canyon where the rock has weathered along vertical cooling joints.

Blocky basaltic talus and slabby-weathering rhyolites that could be used as dimension stone occur throughout the study region. However, none have unique or favorable properties that would make them preferable to other, more accessible deposits closer to markets.

No anomalous concentrations of elements were found in samples from the Owyhee Canyon (NV–010–106) and the Nevada part of the South Fork Owyhee River (NV–010–103A) Wilderness Study Areas, with the exception of one sample that contained 500 ppm (parts per million) lead. The single occurrence of lead in association with high calcium and magnesium but without detectable amounts of other elements associated with base-metal (copper, lead, zinc) mineralization may possibly indicate the presence of mineralized calcite and barite veins in the Tertiary rhyolitic volcanic rocks. Minor amounts of gold were found by panning material from sand and gravel deposits, but the occurrences are too low in grade and too small in volume to support commercial placer operations.

Anomalous amounts of tin, barium, molybdenum, and copper were detected in selected samples from the Idaho part of the South Fork Owyhee River Wilderness Study Area (ID–016–053). Four nonmagnetic heavy-mineral-concentrate samples and one sediment sample contained anomalous amounts of tin, but the mineral resource potential is rated low. Five nonmagnetic concentrate samples contained greater than 1 percent barium, which was determined to be present in the form of barite ($BaSO_4$). Anomalous values for molybdenum were determined for samples from a tributary to the South Fork of the Owyhee River at the northern end of the study area. The source of the molybdenum is not certain. In one nonmagnetic heavy-mineral-concentrate sample from the northern border of the study area, 200 ppm (parts per million) copper was detected. No discrete copper minerals were identified.

Secondary silica enrichment is common in the rhyolites; veins and vugs filled with chalcedony and common opal are present locally. A very small proportion of the chalcedony and opal are of gemstone quality. Only two abandoned mining claims (the Owyhee No.'s 1 and 2) located in 1939, possibly for these minerals, are known (pl. 1), and the total value of chalcedony and opal recovered within the wilderness study areas is estimated at about $100. About 1 mi outside the northernmost wilderness study area, the Lu-Lew prospect (pl. 1) annually yields small amounts of similar, but somewhat higher quality, chalcedony and opal-chalcedony laminates. The Lu-Lew area shows some evidence for metallic-resource-forming processes and is classified as having a low mineral resource potential for gold, silver, and mercury (Ach and others, 1986). The claims inside the study region, however, do not show any evidence of metallic minerals.

Regionally, zeolites occur in altered rhyolite and tuffaceous sedimentary rocks, and diatomite occurs in lacustrine sedimentary rocks. However, similar occurrences were not noted in such rocks between the rhyolites and basalts in the three wilderness study areas. Oil and gas leases cover large areas of the study region, but no resources have been identified, and no coal deposits are known. Petroleum potential for all three wilderness study areas was rated "zero to low" by Sandberg (1983a, b). No thermal waters are known within the study region. Tertiary volcanic rocks exposed in the Owyhee Canyon and South Fork Owyhee River Wilderness Study Areas show low potential for all energy and mineral resources.

INTRODUCTION

The Owyhee Canyon (NV–010–106) and South Fork Owyhee River (NV–010–103A and ID–016–053) Wilderness Study Areas are in northeastern Nevada and southwestern Idaho (fig. 1). They extend for 38 mi along the

Chapter B

Mineral Resources of the Bruneau River, Jarbidge River, and Sheep Creek West Wilderness Study Areas, Owyhee County, Idaho

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U.S. GEOLOGICAL SURVEY BULLETIN 1720

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
BRUNEAU RIVER–JACKS CREEK REGION, IDAHO

Mineral Resources of the Bruneau River, Jarbidge River, and Sheep Creek West Wilderness Study Areas, Owyhee County, Idaho

By Viki A. Lawrence, David H. McIntyre,
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SUMMARY

In 1985, the USBM (U.S. Bureau of Mines) and the USGS (U.S. Geological Survey), in cooperation with the Idaho Geological Survey, examined 90,000 acres of the Bruneau River (ID–111–017) Wilderness Study Area, 47,000 acres of the Jarbidge River (ID–017–011) Wilderness Study Area, and the entire 11,680-acre Sheep Creek West (ID–111–036A) Wilderness Study Area to appraise their identified mineral resources and assess their mineral resource potential. Throughout this report, "study area" refers only to the acreage on which mineral surveys were conducted. Identified resources in or near the study areas are (1) Bruneau jasper (a gem-quality jasper) along the boundary between the Bruneau River and Jarbidge River study areas, (2) geothermal sources northwest of the Bruneau River study area (Indian Bathtub) and southeast of the Jarbidge River study area (Murphy Hot Springs), and (3) a limestone deposit northwest of the Bruneau River study area (fig. 1). Parts of the Bruneau River and Jarbidge River study areas have a moderate mineral and energy resource potential for Bruneau jasper and geothermal resources; the rest of these two study areas has a low mineral and energy resource potential for Bruneau jasper and geothermal resources (fig. 1). Both of these study areas have a low mineral and energy resource potential for metals and oil and gas. The Sheep Creek West study area has a low mineral and energy resource potential for Bruneau jasper, metals, geothermal resources, and oil and gas.

The Bruneau River, Jarbidge River, and Sheep Creek West Wilderness Study Areas are located in southwestern Idaho, in the southern part of the Snake River Plain (fig. 1). The countryside consists of gently rolling plateaus into which deep gorges have been cut by Bruneau River, Jarbidge River, and Sheep Creek. Access is provided by dirt roads and jeep trails, as well as from the waterways by raft.

Approximately 38 placer claims for gold and 182 lode and placer claims for jasper, agate, and limestone have been held within and adjacent to the Bruneau River and Jarbidge River Wilderness Study Areas from 1893 to 1981; however, no mining claims are in or adjacent to the Sheep Creek West Wilderness Study Area. Currently (1985), there are eight active mining claims for jasper near Indian Hot Springs along the boundary between the Bruneau River and Jarbidge River study areas. As much as several thousand pounds of gem-quality jasper are mined from the claimed area annually by blasting, bulldozing, and hand sorting. Select material is marketed worldwide as Bruneau jasper. Because demand is moderate, intermittent mining is expected to continue.

No geothermal leases have been issued within or near the Bruneau River, Jarbidge River, or Sheep Creek West study areas. However, geothermal reservoirs, manifested mainly as hot springs, are at three localities near

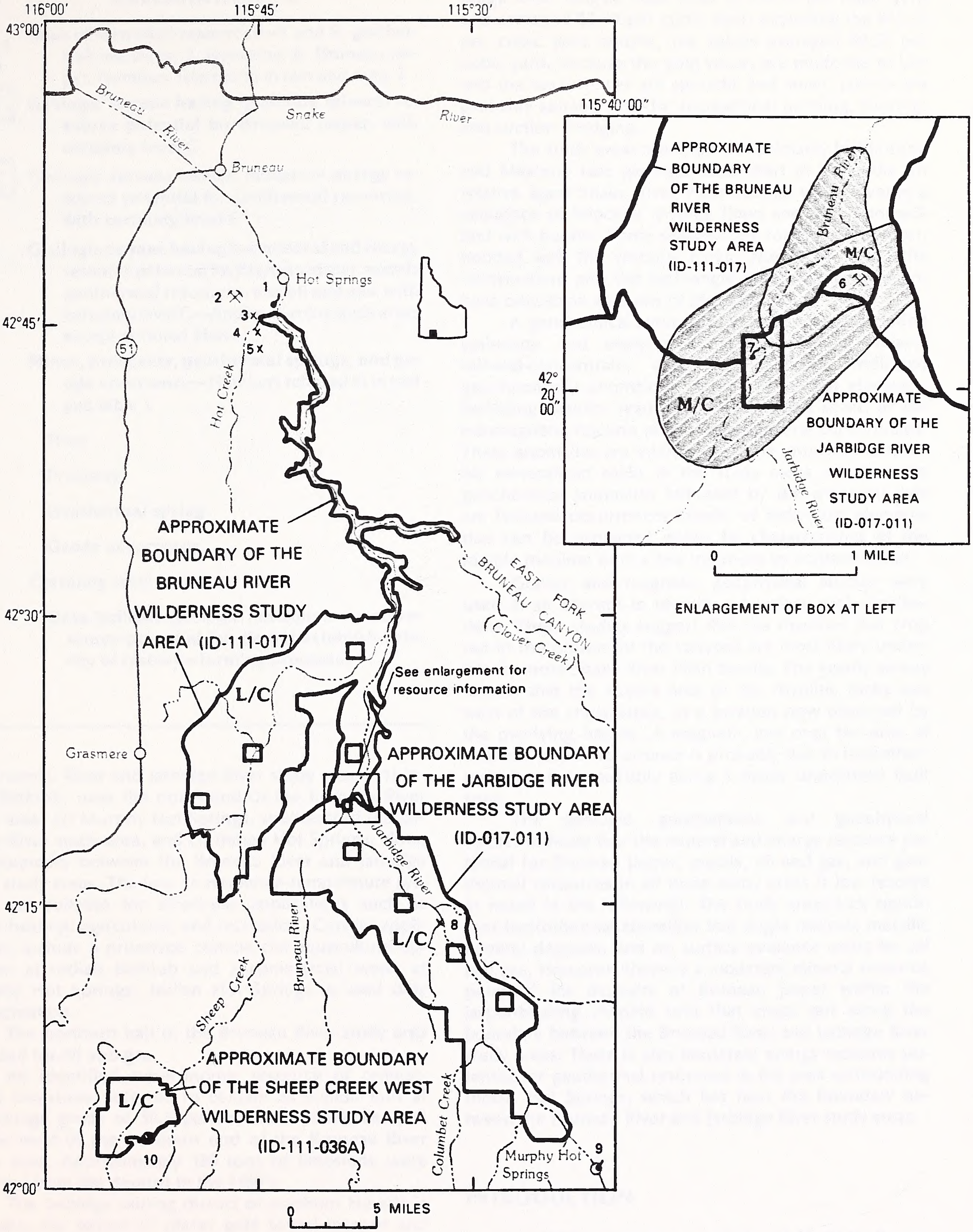
116°00'
115°45'
115°30'
43°00'
42°45'
42°30'
42°15'
42°00'
Bruneau River
Snake River
Bruneau
Hot Springs
1
2
3
4
5
51
Hot Creek
APPROXIMATE BOUNDARY OF THE BRUNEAU RIVER WILDERNESS STUDY AREA (ID-111-017)
EAST FORK BRUNEAU CANYON
(Clover Creek)
See enlargement for resource information
L/C
Grasmere
APPROXIMATE BOUNDARY OF THE JARBIDGE RIVER WILDERNESS STUDY AREA (ID-017-011)
Jarbidge River
Bruneau River
Sheep Creek
8
L/C
APPROXIMATE BOUNDARY OF THE SHEEP CREEK WEST WILDERNESS STUDY AREA (ID-111-036A)
L/C
10
Columbet Creek
Murphy Hot Springs
9
0
5 MILES
115°40'00"
42° 20' 00"
APPROXIMATE BOUNDARY OF THE BRUNEAU RIVER WILDERNESS STUDY AREA (ID-111-017)
Bruneau River
M/C
6
7
M/C
APPROXIMATE BOUNDARY OF THE JARBIDGE RIVER WILDERNESS STUDY AREA (ID-017-011)
Jarbidge River
0
1 MILE
ENLARGEMENT OF BOX AT LEFT

Figure 1 (above and facing page). Map showing (1) location, (2) identified resources and mineral and energy resource potential, and (3) localities of known mines, prospects, geothermal springs, and mineral occurrences of the Bruneau River, Jarbidge River, and Sheep Creek West Wilderness Study Areas and vicinity, Idaho.

EXPLANATION

⚒ 6 🌡 1	Sites of identified resources—1 and 9, geothermal resources; 2, limestone; 6, Bruneau jasper. Numbers referred to in text and table 1
M/C	Geologic terrane having moderate mineral resource potential for Bruneau jasper, with certainty level C
M/C	Geologic terrane having moderate energy resource potential for geothermal resources, with certainty level C
L/C	Geologic terrane having low mineral and energy resource potential for Bruneau jasper, metals, geothermal resources, and oil and gas, with certainty level C—Applies to entire study areas except as noted above
	Mines, prospects, geothermal springs, and geode occurrence—Numbers referred to in text and table 1
⚒	Mine
X	Prospect
🌡	Geothermal spring
▨	Geode occurrence
	Certainty level
C	Data indicate geologic environment and resource potential but do not establish activity of resource-forming processes

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the Bruneau River and Jarbidge River study areas: (1) Indian Bathtub, near the north end of the Bruneau River study area; (2) Murphy Hot Springs, southeast of the Jarbidge River study area, and (3) Indian Hot Springs, along the boundary between the Bruneau River and Jarbidge River study areas. The low- to moderate-temperature systems are suitable for direct-use applications such as space heating, agriculture, and recreation. Current applications include a prototype commercial aquaculture operation at Indian Bathtub and a commercial resort at Murphy Hot Springs; Indian Hot Springs is used only for recreation.

The northern half of the Bruneau River study area is leased for oil and gas.

An identified subeconomic resource of cement-grade limestone, inferred to contain 20 million tons at an average grade of 50.5 percent CaO (lime), lies just to the west of the northern end of the Bruneau River study area. Approximately 100 tons of limestone were quarried from the deposit in the 1950's.

The Jarbidge mining district of northern Nevada is probably the source of placer gold found in sand and gravel bars recently deposited by the Bruneau–Jarbidge River system in the Bruneau River and Jarbidge River study areas. Values detected in placers along the Jarbidge River ranged from $0.01 to $15.00 per cubic yard and averaged $1.40 per cubic yard; excluding the $15.00 per cubic yard sample, the values averaged $0.57 per cubic yard. Because the gold values are moderate to low and the occurrences are sporadic and small, placers are probably suitable only for recreational panning, sluicing, and suction dredging.

The study areas are underlain primarily by Pliocene and Miocene (see geologic time chart in Appendix for relative ages) Snake River Plain basalts, which overlie a sequence of Miocene rhyolite flows and tuffs interbedded with basalts. Some sedimentary rocks are also interbedded with the volcanic rocks. The rocks show little deformation, and the high-angle faults that are present have only small amounts of displacement.

A geochemical survey of the areas, which included collection and analyses of stream-sediment, heavy-mineral-concentrate, and rock samples, indicated geochemically anomalous values for several elements, including barium, lead, tin, thorium, and silver, in the nonmagnetic fraction of the heavy-mineral concentrates. These anomalies are interpreted to be unrelated to notably mineralized rocks in the study areas. Most of the geochemical anomalies indicated by the analytical data are isolated occurrences chiefly of individual elements that can be explained either by characteristics of the sample medium or in a few instances by contamination.

Gravity and magnetic geophysical studies were used in an attempt to identify subsurface rock distributions. These studies suggest that the rhyolites that crop out in the bottom of the canyons are most likely underlain by more Snake River Plain basalts. The gravity survey reveals that the source area of the rhyolitic rocks was west of the study areas, in a location now obscured by the overlying basalts. A magnetic low over the area of Bruneau jasper occurrence is probably due to hydrothermal alteration, possibly along a major unexposed fault zone.

The geologic, geochemical, and geophysical studies indicate that the mineral and energy resource potential for Bruneau jasper, metals, oil and gas, and geothermal resources in all three study areas is low (except as noted in the following). The study areas lack significant hydrothermal alteration that might indicate metallic mineral deposits, and no surface evidence exists for oil and gas. However, there is a moderate mineral resource potential for deposits of Bruneau jasper within the jasper-bearing rhyolite unit that crops out along the boundary between the Bruneau River and Jarbidge River study areas. There is also moderate energy resource potential for geothermal resources in the area surrounding Indian Hot Springs, which lies near the boundary between the Bruneau River and Jarbidge River study areas.

INTRODUCTION

In 1985, at the request of the BLM (U.S. Bureau of Land Management), the USGS and the USBM, in cooperation with the Idaho Geological Survey, conducted

Chapter B

Mineral Resources of the King Hill Creek Wilderness Study Area, Elmore County, Idaho

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U.S. GEOLOGICAL SURVEY BULLETIN 1721

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
SOUTH-CENTRAL IDAHO

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—SOUTH-CENTRAL IDAHO

Mineral Resources of the King Hill Creek Wilderness Study Area, Elmore County, Idaho

By Margo I. Toth, Harley D. King, *and* Dolores M. Kulik
U.S. Geological Survey

Andrew M. Leszcykowski
U.S. Bureau of Mines

SUMMARY

In 1985 the U.S. Bureau of Mines and the U.S. Geological Survey conducted investigations to appraise the identified mineral resources and assess the mineral resource potential of the King Hill Creek (ID–019–002) Wilderness Study Area. These investigations revealed no identified mineral resources. A small area in the northwestern part of the study area has moderate potential for undiscovered antimony, arsenic, and gold resources in the Idavada Volcanics (fig. 1). The remaining part of the study area has low mineral resource potential for all undiscovered metals, and the entire study area has low mineral resource potential for undiscovered oil, gas, and coal and moderate potential for undiscovered resources of geothermal energy.

The King Hill Creek Wilderness Study Area is 5 mi (miles) north of the small town of King Hill, Elmore County, Idaho, and is south of the Mount Bennett Hills (fig. 1). Rugged, brushy hills characterize the northern part of the area and change to grassy, gently sloping basalt-covered plateaus in the southern part of the study area. Access is by a well-maintained gravel road along the western side of the area and by four-wheel-drive roads which approach the study area from the north and south; there is no road access to the eastern side of the area.

No mines, claims, mineral leases, or identified resources are in the study area. The Volcano mining district is just north of the study area, and two mines in the district have records of past production of gold, silver, copper, and lead. Development work is currently (1987) in progress on the Old Glory mine 5 mi north of the study area.

The King Hill Creek Wilderness Study Area is on the northern edge of the Snake River Plain. Rocks of the Miocene (see geologic time chart in Appendix) Idavada Volcanics crop out in the northern part of the study area and are overlain in the southern part by basalt flows of the Miocene Banbury Basalt, of the Pliocene Glenns Ferry Formation, and of the Pliocene and Pleistocene Bruneau Formation. Outcrops of granite of the Idaho batholith are northeast of the area.

As a part of this study, rock and stream-sediment samples and a water sample were collected for geochemical analysis. One rock sample from the northwestern part of the study area had anomalous concentrations of arsenic and antimony. None of the other samples showed anomalous concentrations of any elements typical of mineral deposits.

The study area lies along a steep gravity gradient, between low-density granitic rocks to the north and higher density basalts of the Snake River Plain to the south. Granitic rocks may underlie the northern part of the study area. Aeromagnetic data are typical of Tertiary volcanic rocks of the southern part of Idaho.

A small area of the Idavada Volcanics in the northwestern part of the study area has many of the characteristics of volcanic-hosted disseminated gold deposits, and a rock sample from the area yielded anomalous concentrations of arsenic and antimony. The mineral resource potential for undiscovered arsenic, antimony, and gold resources in these rocks is therefore moderate.

The geologic environment, the lack of other geochemical anomalies in the rock, stream sediment, and water samples, and the lack of any mines or pros-

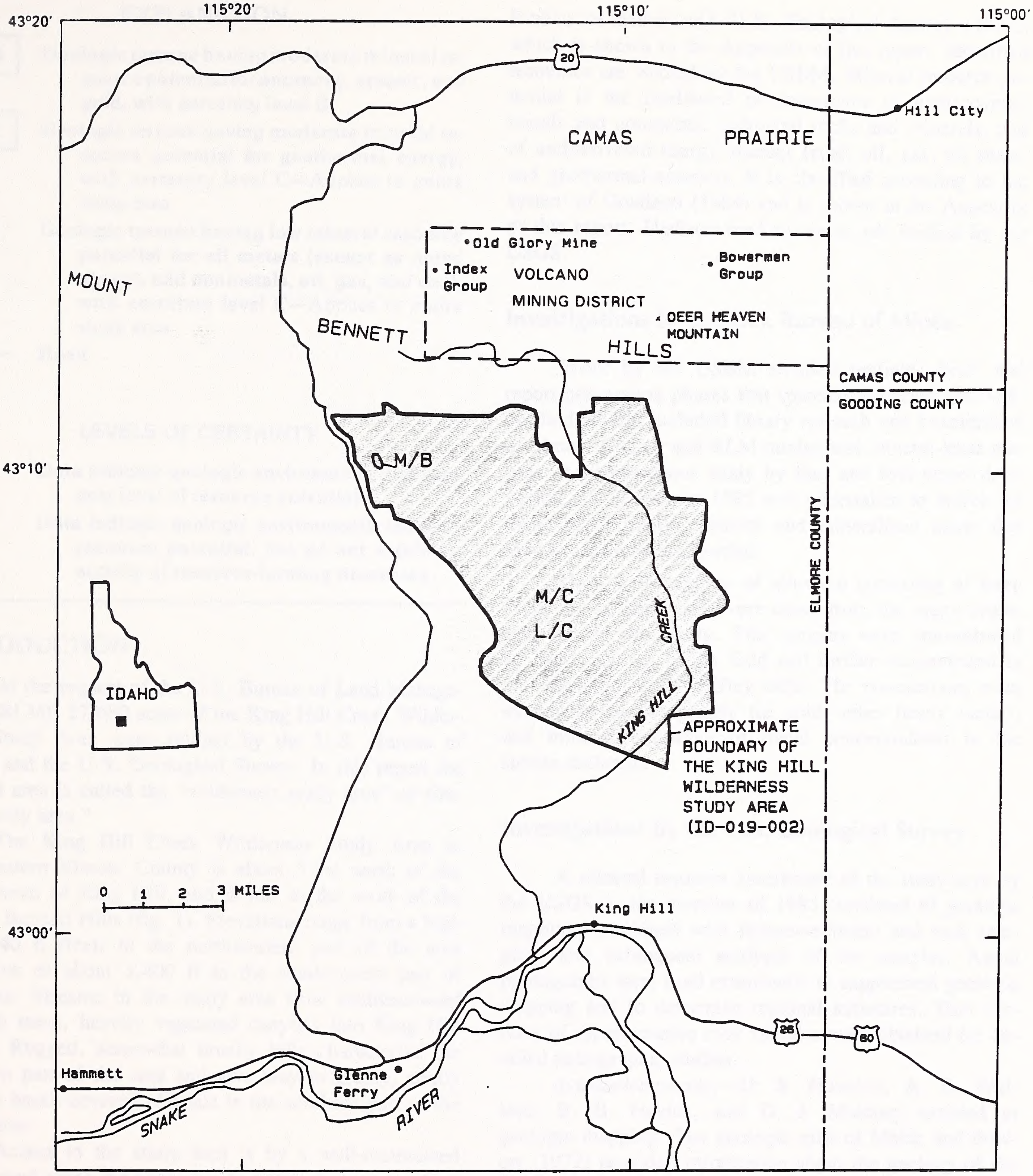

Figure 1 (above and facing page). Map showing mineral resource potential and location of the King Hill Creek Wilderness Study Area, Elmore County, Idaho.

pects indicate that the resource potential for all metals in the rest of the wilderness study area is low. The area also lacks host rocks and structures favorable for the occurrence of oil, gas, and coal. The resource potential for these commodities is therefore also low.

Although the study area is located between two geothermal resource areas, no surface manifestations of geothermal resources are presently known in the study area. The potential for undiscovered geothermal resources is therefore moderate.

EXPLANATION

M/B	Geologic terrane having moderate mineral resource potential for antimony, arsenic, and gold, with certainty level B
M/C	Geologic terrane having moderate mineral resource potential for geothermal energy, with certainty level C—Applies to entire study area
L/C	Geologic terrane having low mineral resource potential for all metals (except as noted above), and nonmetals, oil, gas, and coal, with certainty level C—Applies to entire study area
———	Road

LEVELS OF CERTAINTY

B	Data indicate geologic environment, and suggest level of resource potential
C	Data indicate geologic environment, indicate resource potential, but do not establish activity of resource-forming processes

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INTRODUCTION

At the request of the U.S. Bureau of Land Management (BLM), 27,680 acres of the King Hill Creek Wilderness Study Area were studied by the U.S. Bureau of Mines and the U.S. Geological Survey. In this report the studied area is called the "wilderness study area" or simply "study area."

The King Hill Creek Wilderness Study Area in southeastern Elmore County is about 5 mi north of the small town of King Hill, and is just to the south of the Mount Bennett Hills (fig. 1). Elevations range from a high of 6,140 ft (feet) in the northwestern part of the area to a low of about 3,400 ft in the southeastern part of the area. Streams in the study area flow southeastward through steep, heavily vegetated canyons into King Hill Creek. Rugged, somewhat brushy hills characterize the northern part of the area and give way to grassy, gently sloping basalt-covered plateaus in the southern part of the study area.

Access to the study area is by a well-maintained gravel road along the western side of the study area which connects Glenns Ferry to U.S. Highway 20. Four-wheel-drive roads approach the study area from the north and south, but there is no access along the eastern side of the area.

This report presents an evaluation of the mineral endowment (identified resources and mineral resource potential) of the study area and is the product of several separate studies by the U.S. Bureau of Mines (USBM) and the U.S. Geological Survey (USGS). Identified resources are classified according to the system of the U.S. Bureau of Mines and U.S. Geological Survey (1980), which is shown in the Appendix of this report. Identified resources are studied by the USBM. Mineral resource potential is the likelihood of occurrence of undiscovered metals and nonmetals, industrial rocks and minerals, and of undiscovered energy sources (coal, oil, gas, oil shale, and geothermal sources). It is classified according to the system of Goudarzi (1984) and is shown in the Appendix of this report. Undiscovered resources are studied by the USGS.

Investigations by the U.S. Bureau of Mines

Work by the USBM entailed prefield, field, and report-preparation phases that spanned the years 1985–86. Prefield studies included library research and examination of Elmore County and BLM mining and mineral-lease records. Reconnaissance study by foot and four-wheel-drive vehicle of the area in 1985 was undertaken to search for evidence of mining activity and mineralized zones that may not have been recorded.

Three grab samples of alluvium consisting of three 14-in. (inch) pans each were taken from the major drainages during this study. The samples were concentrated by hand panning in the field and further concentrated in the laboratory on a Wilfley table. The concentrates were examined microscopically for gold, other heavy metals, and mineral indicators of metal concentrations in the stream drainages.

Investigations by the U.S. Geological Survey

A mineral resource assessment of the study area by the USGS in the summer of 1985 consisted of geologic mapping, combined with stream-sediment and rock sampling and subsequent analyses of the samples. Aerial photographs were used extensively to supplement geologic mapping and to determine regional structures. Thin sections of representative rock samples were obtained for detailed petrographic studies.

Acknowledgments.—D. S. Hovorka, A. R. Wallace, B. B. Nevins, and D. J. Maloney assisted in geologic mapping. The geologic map of Malde and Powers (1972) provided information about the geology of the southern part of the study area.

APPRAISAL OF IDENTIFIED RESOURCES

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There has been no mineral production from the study area. The Volcano mining district is just north of the study area, and USBM records indicate that two mines

Geological and Geophysical Investigations
and Mineral Resource Potential of the proposed
Great Rift Wilderness Area, Idhao

by

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Lisa A. McBroome, Don R. Mabey, W. D. Stanley, and
H. R. Covington
U. S. Geolgical Survey

and

James Ridenour and Ronald B. Stotelmeyer
U. S. Bureau of Mines

U.S. Geolgical Survey
Open-File Report 80-475

Summary

by

U.S. Geological Survey

and

U.S. Bureau of Mines

The proposed wilderness area has only a few recently staked mining claims. Mineral potential of the area is confined to decorative stone, consisting of filamented pahoehoe, and cinders. Based on ground reconnaissance, it is estimated that these are about 116,000 tons of indicated stone resources and a half-million tons of inferred resources, most of which are in the southern part of the study area. In the northern part, there are at least 27 million cubic yards of cinders. Mineral, petroleum, and geothermal resources may exist beneath the lavas of the study area but extensive geophysical exploration and drilling would be required to prove their existence.

Aeromagnetic, gravity, and magnetotelluric studies of the proposed wilderness area have yielded basic data on the nature of the crust beneath the young lava flows, and provided data for an assessment of potential resources. Magnetic anomalies in the area are complex and result from both strongly magnetized surface and near-surface lava flows and magnetic rocks underlying the flows. The magnetic data suggest that a deep intrusive body underlies the study area. Gravity anomalies are related to variations in the thickness of Cenozoic volcanic rocks and possibly to the inferred intrusive body. Magnetotelluric studies have provided data for interpreting the structure and possible rock types in the upper 10 km of the crust.

The proposed Great Rift Wilderness area is a region of volcanic rocks less than about 15,000 years old in the eastern Snake River Plain, Idaho. The area is located adjacent to the Craters of the Moon National Monument along the Great Rift, a linear array of cinder cones, eruptive fissures, and open cracks that extend for a distance of about 85 km from the southern Pioneer Mountains northwest of the map area, southeast through the Monument, to the southern margin of the Snake River Plain. The Great Rift is the site of volcanic vents that erupted lava flows of the Craters of the Moon, Kings Bowl, and Wapi lava fields. The Craters of the Moon lava field was formed between about 15,000 and 2,000 years ago during at least 7 periods of volcanic activity, each of which lasted about 1,000 years or less. The Kings Bowl and Wapi lava fields were both formed during a brief eruptive period about 2,250 years ago.

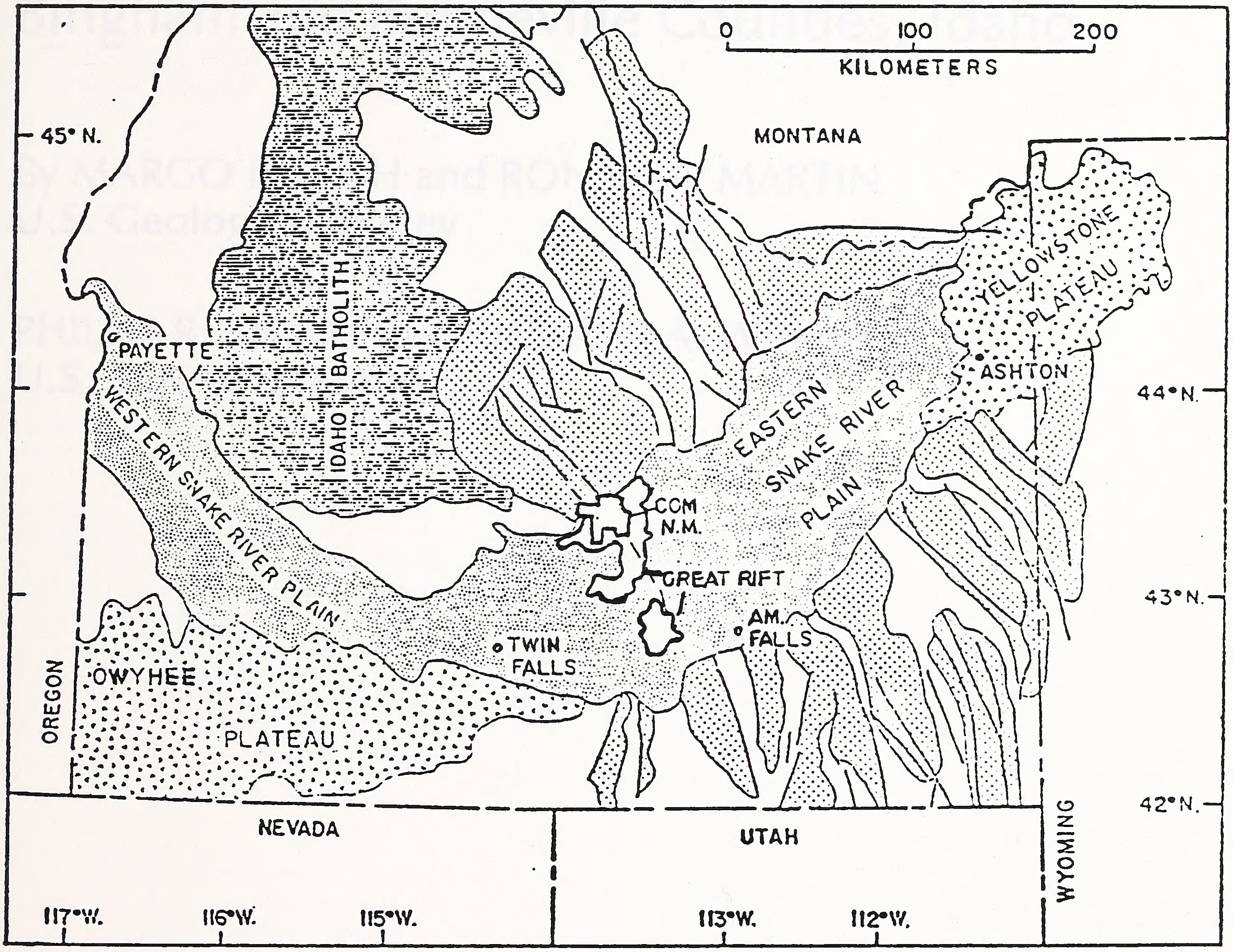

Figure 1.--Map showing location of the Great Rift Wilderness Study Area. The study area has indicated resources of decorative stone, most of which are in the southern part of the study area. The study area has low potential for metals, oil and gas, and geothermal energy at the surface. COM = Craters of the Moon National Monument.

Chapter A

Mineral Resources of the Hell's Half Acre Wilderness Study Area, Bingham and Bonneville Counties, Idaho

By MARGO I. TOTH and RONNY A. MARTIN
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U.S. GEOLOGICAL SURVEY BULLETIN 1718

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
SOUTHEASTERN IDAHO

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—SOUTHEASTERN IDAHO

Mineral Resources of the Hell's Half Acre Wilderness Study Area, Bingham and Bonneville Counties, Idaho

By Margo I. Toth *and* Ronny A. Martin,
U.S. Geological Survey, *and*
Phillip R. Moyle *and*
Richard A. Winters,
U.S. Bureau of Mines

SUMMARY

The Hell's Half Acre Wilderness Study Area (ID-33-15) covers about 66,200 acres of very young basalt of the Snake River Group in Bingham and Bonneville Counties, southeastern Idaho, and lies 6 mi (miles) west of Idaho Falls. A joint mineral resource appraisal study of the wilderness study area was done in the summer months of 1984 by the U.S. Geological Survey and U.S. Bureau of Mines. The appraisal showed that the study area has identified resources of decorative stone (fig. 1). The mineral resource potential for metals, oil and gas, coal, and geothermal energy is low.

The wilderness study area is on the eastern edge of the Snake River Plain physiographic province, a broad, arcuate volcanic rock-filled depression containing basaltic lava flows as much as 6,000 ft (feet) thick. The study area encompasses more than half of the area of the Hell's Half Acre lava field, whose lavas were erupted about 4,100±200 years ago (Karlo, 1977a). The study area is characterized by a flat moonscape terrain with fissures, caves, ridges, depressions, and sparse vegetation. The basalts of the lava field are gray to black and unweathered, and contain phenocrysts of olivine and plagioclase. Chemically, they are typical of the Snake River Group, characterized by low SiO_2, high total iron, and low total alkali elements. A small calderalike crater in the northwestern part of the study area was the source of the basaltic eruptions. Basalts adjacent to the study area are from 780 to 1,130 ft thick.

The only mineralized rock in the study area contains sulfate minerals associated with the central vent of the Hell's Half Acre lava field. Thenardite, gypsum, and bloedite were identified as fumarolic crusts along fractures and as powdery deposits which fill cavities between flow units in the walls of the vent. None of the sulfates showed any enrichment in gold, arsenic, mercury, or antimony. Analysis of 10 typical samples of basalt showed no anomalous concentrations of any elements which might be associated with mineralization.

The wilderness study area contains 43,000 tons of indicated reserves and 106,000 tons of indicated and inferred, subeconomic resources of slab pahoehoe suitable for use as a decorative veneer. The lavas of the Hell's Half Acre Wilderness Study Area have a moderate likelihood of development for decorative stone. Most areas which contain suitable stone lie near the edge of the lava field, and minimal road construction would be required for access.

INTRODUCTION

The Hell's Half Acre Wilderness Study Area (ID-33-15) in Bingham and Bonneville Counties, Idaho (fig. 2), comprises 66,200 acres covered by very young basalt. The eastern border of the study area lies about 6 mi west of Idaho Falls, and the southern border lies about 10 mi north of Blackfoot. U.S. Highway 20 roughly parallels the study area on the north, and U.S. Highway 26-Interstate 15 approaches the study area on the east. Access to the southern part of the study area is by dirt roads which lead to Morgans Pasture. Most of the study area is inaccessible by vehicle due to the rough surface of the young basalt flows. However, secondary and unimproved roads provide access to most of the wilderness area boundary.

The Hell's Half Acre Wilderness Study Area is characterized by a flat, moonscape terrain marked by crevices, fissures, caves, ridges, depressions, and very sparse vegetation. Topographic relief ranges from a low of 4,690 ft along the southern margin, to 5,351 ft at the central vent in the northwestern part of the study area. Lichens and mosses grow on the younger lava flows, and diverse plants including juniper trees, sagebrush, and grasses grow on older lava flows, called kipukas. No streams are within the study area, and all precipitation infiltrates directly into the Snake River Plain aquifer 200 to 800 ft below the surface (Mundorff and others, 1964).

The USGS (U.S. Geological Survey) made a mineral resource assessment of the Hell's Half Acre Wilderness Study Area in the summer of 1984. The work consisted of field checking previous mapping by

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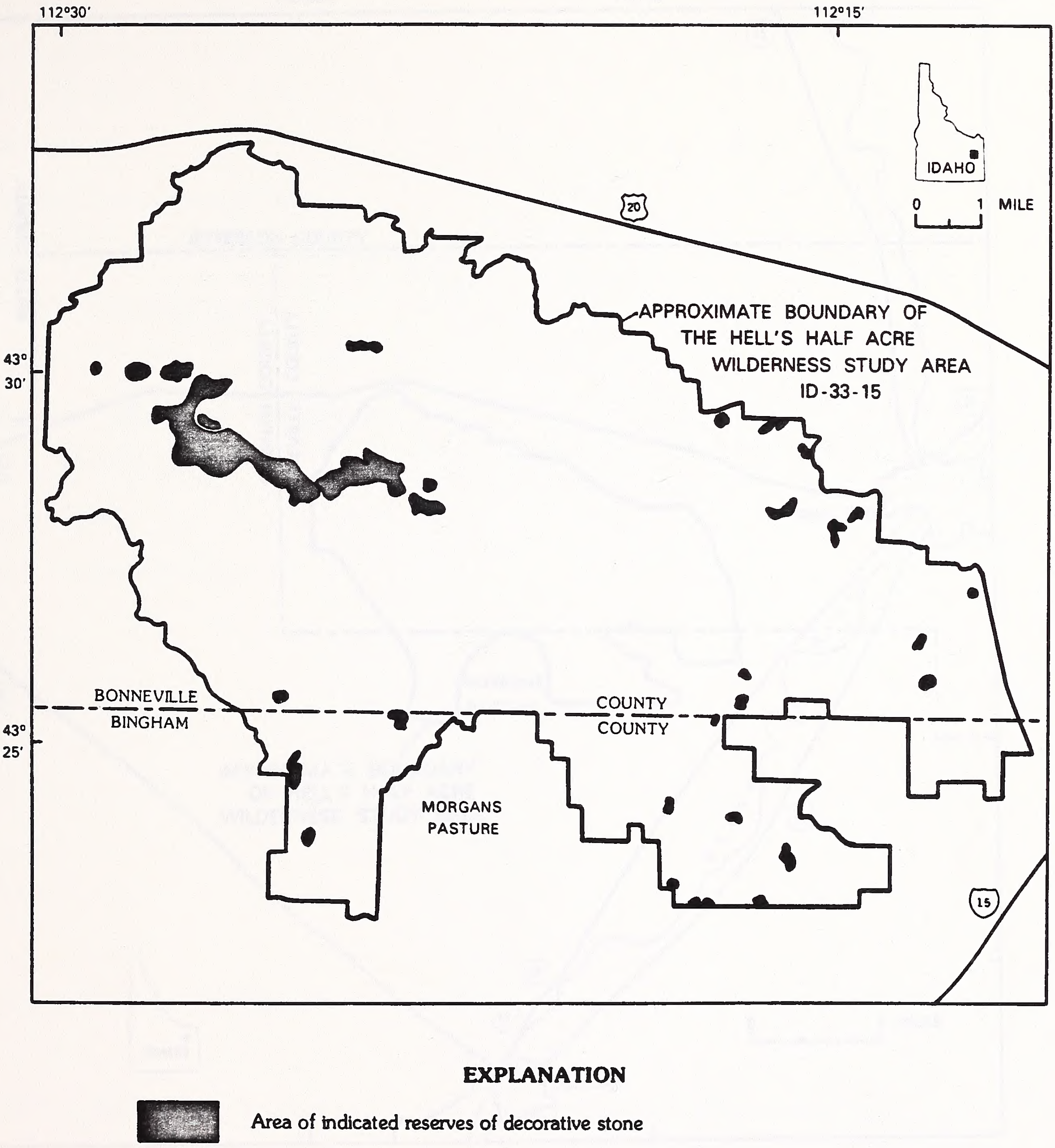

112°30'
112°15'
IDAHO
0 1 MILE
20
APPROXIMATE BOUNDARY OF THE HELL'S HALF ACRE WILDERNESS STUDY AREA ID-33-15
43° 30'
BONNEVILLE
BINGHAM
COUNTY
COUNTY
43° 25'
MORGANS PASTURE
15
EXPLANATION
Area of indicated reserves of decorative stone

Figure 1. Map showing mineral resource potential and identified resources in the Hell's Half Acre Wilderness Study Area, Idaho. The study area has low mineral resource potential for metals, oil and gas, coal, and geothermal energy, with certainty level C. Unpatterned areas contain indicated and inferred subeconomic resources of decorative stone.

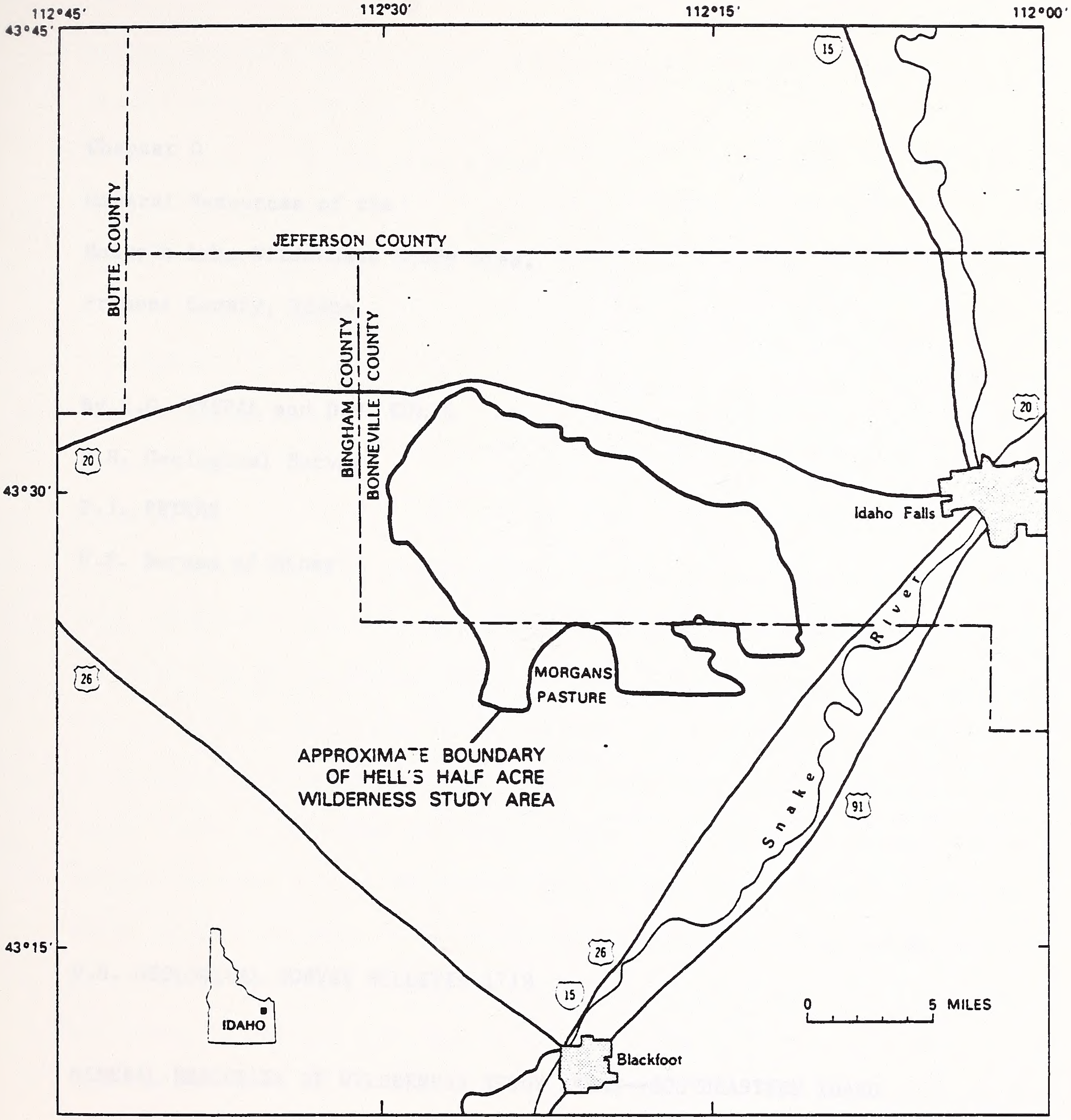


Figure 2. Index map showing the location of the Hell's Half Acre Wilderness Study Area, Bingham and Bonneville Counties, Idaho.

Chapter D

Mineral Resources of the Henry's Lake Wilderness Study Area, Fremont County, Idaho

By R.G. TYSDAL and D.M. KULIK
U.S. Geological Survey
T.J. PETERS
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1718

MINERAL RESOURCES OF WILDERNESS STUDY AREAS--SOUTHEASTERN IDAHO

MINERAL RESOURCES OF WILDERNESS STUDY AREAS--SOUTHEASTERN IDAHO

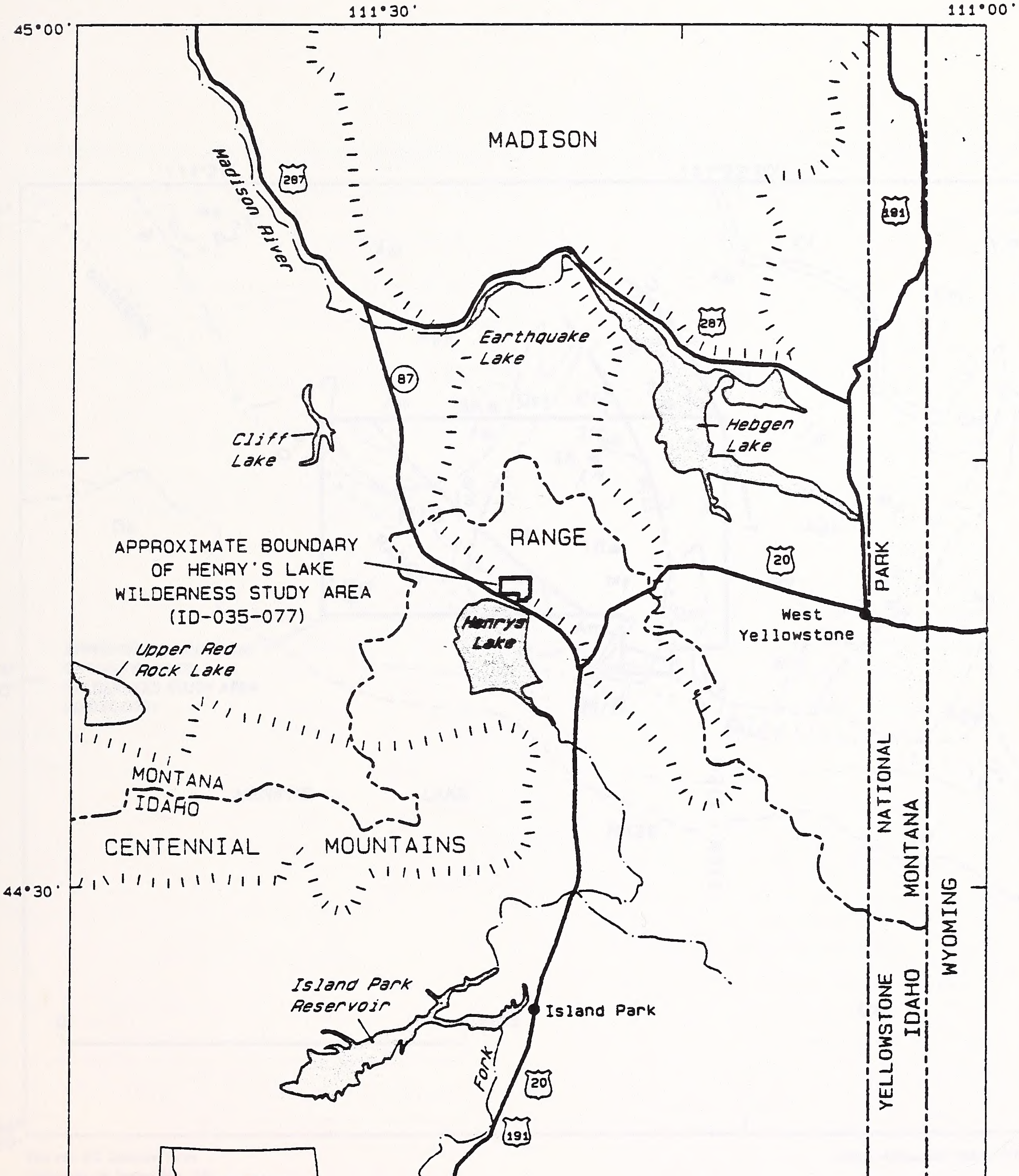
Mineral Resources of the Henry's Lake Wilderness Study Area, Fremont County, Idaho

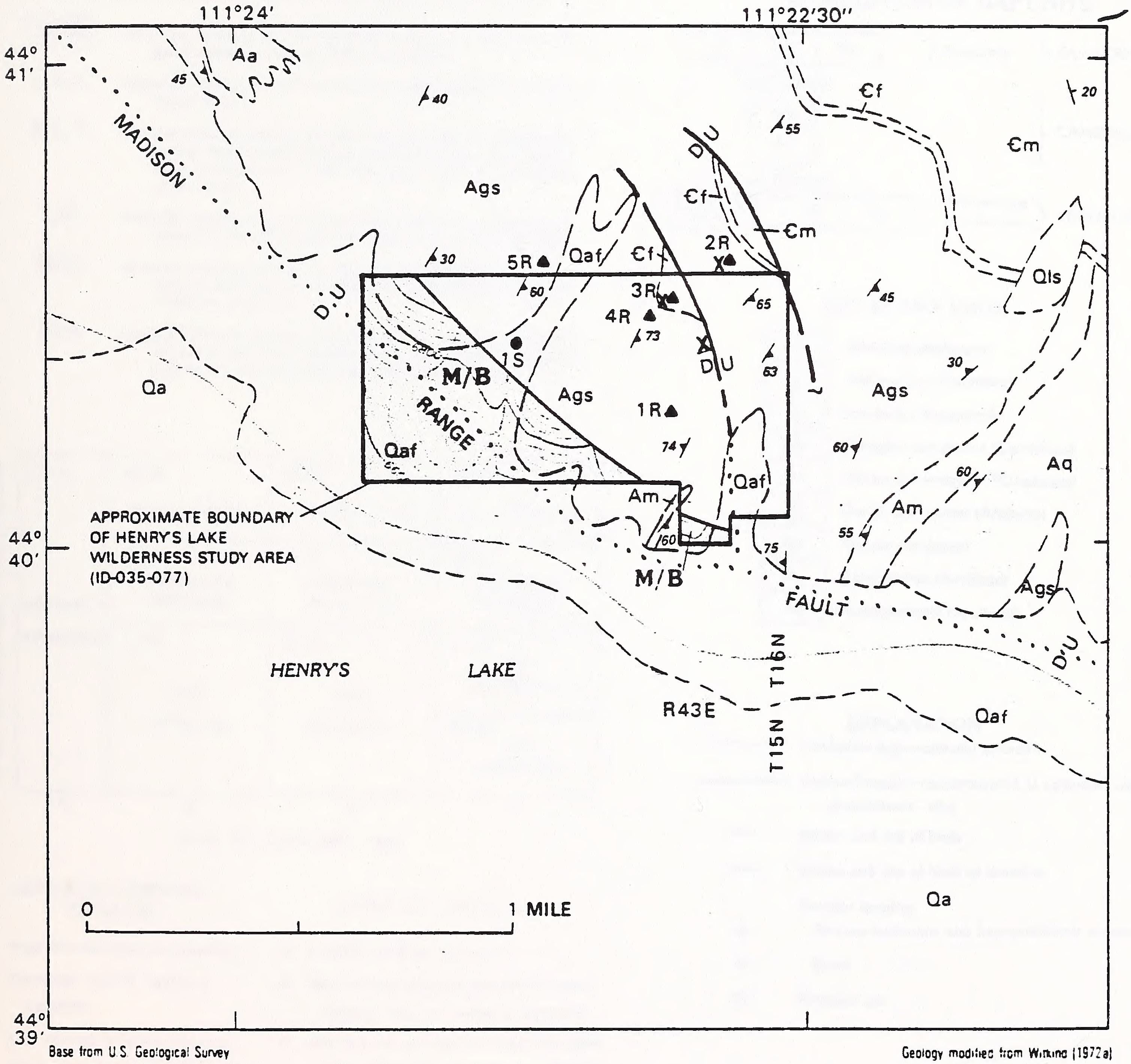
By R.G. Tysdal and D.M. Kulik
U.S. Geological Survey
T.J. Peters
U.S. Bureau of Mines

SUMMARY

Abstract

A mineral resource survey of the 350-acre Henry's Lake Wilderness Study Area (ID-035-077) was made in 1986-87. The wilderness study area is in the southern part of the Madison Range, Fremont County, Idaho, and is about 17 mi (miles) north of the hamlet of Island Park. No identified resources (known) or currently active claims exist within or adjacent to the wilderness study area. There is potential for several types of undiscovered mineral resources within the study area. The southwestern part of the wilderness study area, along the Madison Range fault, is rated as having a moderate energy resource potential for geothermal water; the remainder of the study area has a low potential for resources of this commodity. A small outcrop of marble in the southernmost part of the study area has a low mineral resource potential for talc; for talc in marble possibly concealed beneath the study area the mineral resource potential is rated as unknown. The study area has a low mineral resource potential for iron in hematite-mineralized amphibolite gneiss, and for gold, silver, and uranium. The area has no mineral resource potential for phosphate, because the host strata have been eroded; and no resource potential for oil and gas.


111°30'
111°00'
45°00'
44°30'
MADISON
RANGE
Madison River
287
191
287
Earthquake Lake
87
Cliff Lake
Hebgen Lake
APPROXIMATE BOUNDARY OF HENRY'S LAKE WILDERNESS STUDY AREA (ID-035-077)
20
Henrys Lake
West Yellowstone
Upper Red Rock Lake
MONTANA
IDAHO
CENTENNIAL
MOUNTAINS
YELLOWSTONE
NATIONAL
PARK
MONTANA
IDAHO
WYOMING
Island Park Reservoir
Island Park
Fork
20
191
Henrys
0
5 MILES
MONTANA
IDAHO
WYO.

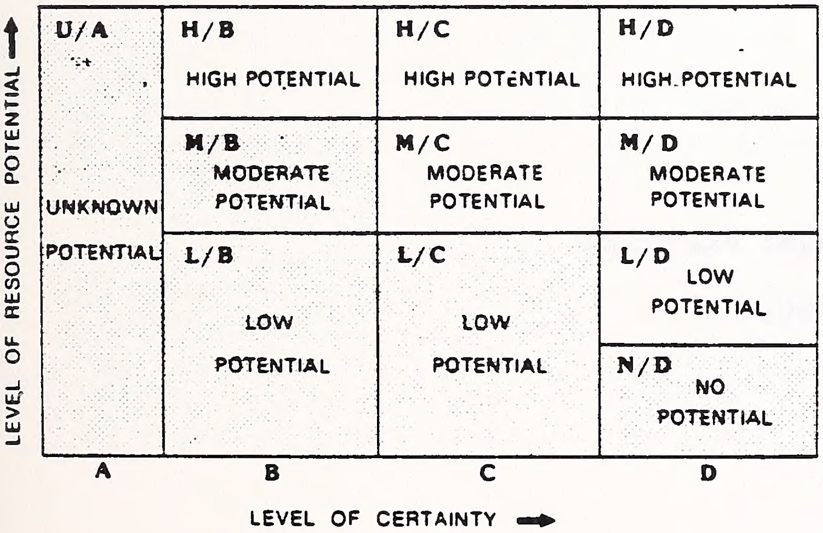


Base from U.S. Geological Survey
TargheePass and Targhee Peak, 1964

Geology modified from Witkind (1972a)

EXPLANATION OF MINERAL RESOURCE POTENTIAL

M/B	Geologic terrane having moderate resource potential for geothermal energy, at certainty level B
1 L/C	Geologic terrane having low resource potential for talc, at certainty level C
2 L/C	Geologic terrane having low resource potential for geothermal energy, iron in amphibolite, gold, and silver, at certainty level C—Applies to entire wilderness study area, except as noted above
L/B	Geologic terrane having low resource potential for uranium, at certainty level B—Applies to entire wilderness study area
N/D	Geologic terrane having no resource potential for phosphate and oil and gas, at certainty level D—Applies to entire wilderness study area
U/A	Geologic terrane having unknown mineral resource potential for talc in concealed marble, at certainty level A—Applies to entire wilderness study area, except as noted above



LEVELS OF RESOURCE POTENTIAL

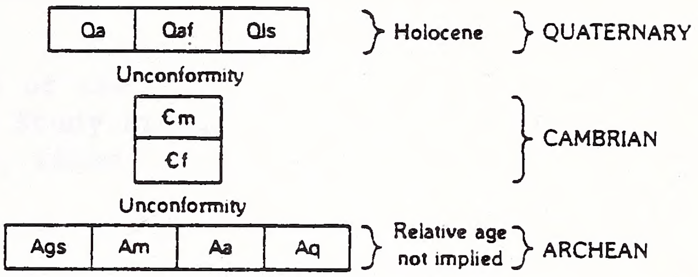
- **H** High mineral resource potential
- **M** Moderate mineral resource potential
- **L** Low mineral resource potential
- **U** Unknown mineral resource potential
- **N** No known mineral resource potential

LEVELS OF CERTAINTY

- **A** Available data not adequate
- **B** Data indicate geologic environment and suggest level of resource potential
- **C** Data indicate geologic environment, give good indication of level of resource potential, but do not establish activity of resource-forming processes
- **D** Data clearly define geologic environment and level of resource potential and indicate activity of resource-forming processes in all or part of the area

Diagram showing relationships between levels of mineral resource potential and levels of certainty. Shading shows levels that apply to this study area

CORRELATION OF MAP UNITS



LIST OF MAP UNITS

Qa	Alluvium (Holocene)
Qaf	Alluvial fan (Holocene)
Qls	Landslide (Holocene)
Єm	Meagher Limestone (Cambrian)
Єf	Flathead Sandstone (Cambrian)
Ags	Gneiss and schist (Archean)
Am	Marble (Archean)
Aa	Amphibolite (Archean)
Aq	Metaquartzite (Archean)

EXPLANATION

—	Contact—Approximately located
━	Fault—Dotted where concealed. U, upthrown side; D, downthrown side
┴	Strike and dip of beds
▲	Strike and dip of beds of foliation
	Sample locality
●	Stream sediment and heavy-mineral concentrate
▲	Rock
✕	Prospect pit

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Mineral resources of the Worm Creek Wilderness Study Area, Bear Lake County, Idaho

By

B.B. Houser[1]
and
Richard L. Rains[2]

Open-File Report 88-_____

1988

This report is preliminary and has not been reviewed
for conformity with U.S. Geological Survey
editorial standards and stratigraphic nomenclature.

[1] U.S. Geological Survey
Denver, Colorado

[2] U.S. Bureau of Mines
Denver, Colorado

ABSTRACT

At the request of the U.S. Bureau of Land Management, the 40-acre Worm Creek Wilderness Study Area (ID-037-077), Bear Lake County, Idaho, was studied for its mineral resources and resource potential. Bureau of Mines studies were in 1984. There are no mines, mineralized areas, and no identified resources at the surface. The mineral resource potential for undiscovered phosphate and vanadium resources in the study area is unknown, for undiscovered lead-silver-copper-gold resources in replacement deposits it is low, and for undiscovered oil and gas, the energy resource potential is moderate.

SUMMARY

Character and Setting

The Worm Creek Wilderness Study Area (ID-037-077) is in southeastern Idaho about 8 mi northwest of Bear Lake and 14 mi southwest of Montpelier, Idaho (fig. 1). The study area is on the eastern side of the Bear River Range of the Wasatch Mountains and is bounded on the west and south by the Cache National Forest. Access is by a graded road in the valley of Bloomington Creek 1/4 mi north of the area. The 40-acre wilderness study area lies on a steep north-facing slope about 200 ft above Bloomington Creek, and ranges in elevation from 6,680 ft at its northern boundary to 7,200 ft at its southern boundary.

The rocks of the study area are in the upper plate of the Paris thrust fault near the western edge of the Cordilleran overthrust belt of Idaho, Wyoming, and Utah. This is a terrane of north-south-trending, eastward-directed folds and imbricate thrust faults. The area is underlain by the upper part of the Upper Cambrian St. Charles Limestone (fig. 2) (see geologic time chart in Appendix) which is covered by Pleistocene diamicton in the northern half of the area. The trace of the Paris fault passes about 3 mi east of the wilderness study area. The fault plane dips at about 30° SW, and the Paleozoic rocks in the vicinity of the study area strike north-northwest and dip southwest at about 15°. The Bouguer gravity anomaly map shows only regional anomaly trends and the effects of Basin and Range normal faulting in this part of southeastern Idaho.

Identified Resources and Resource Potential

There has been no mining activity within the study area and no mineral resources were identified. Currently (1988) there are no mining claims in the area. The study area has not been offered for oil and gas leasing because it is under wilderness consideration.

Approximately 80,000 long tons of phosphate were produced between 1916 and 1932 about 3 mi east of the area from the Paris-Bloomington deposits of the Montpelier phosphate district. These deposits are in the Permian Phosphoria Formation in the lower plate of the Paris thrust fault and contain 0.6-0.9 percent vanadium. Although the Paris fault dips westward beneath the study area, the complex folding and imbricate thrusting typical of rocks within thrust sheets make it impossible to state that the Phosphoria Formation is present at depth beneath the area. Therefore, on the basis of available data the resource potential of the wilderness study area for undiscovered phosphate and vanadium is rated as unknown with certainty level A (see mineral resource classification system in Appendix).

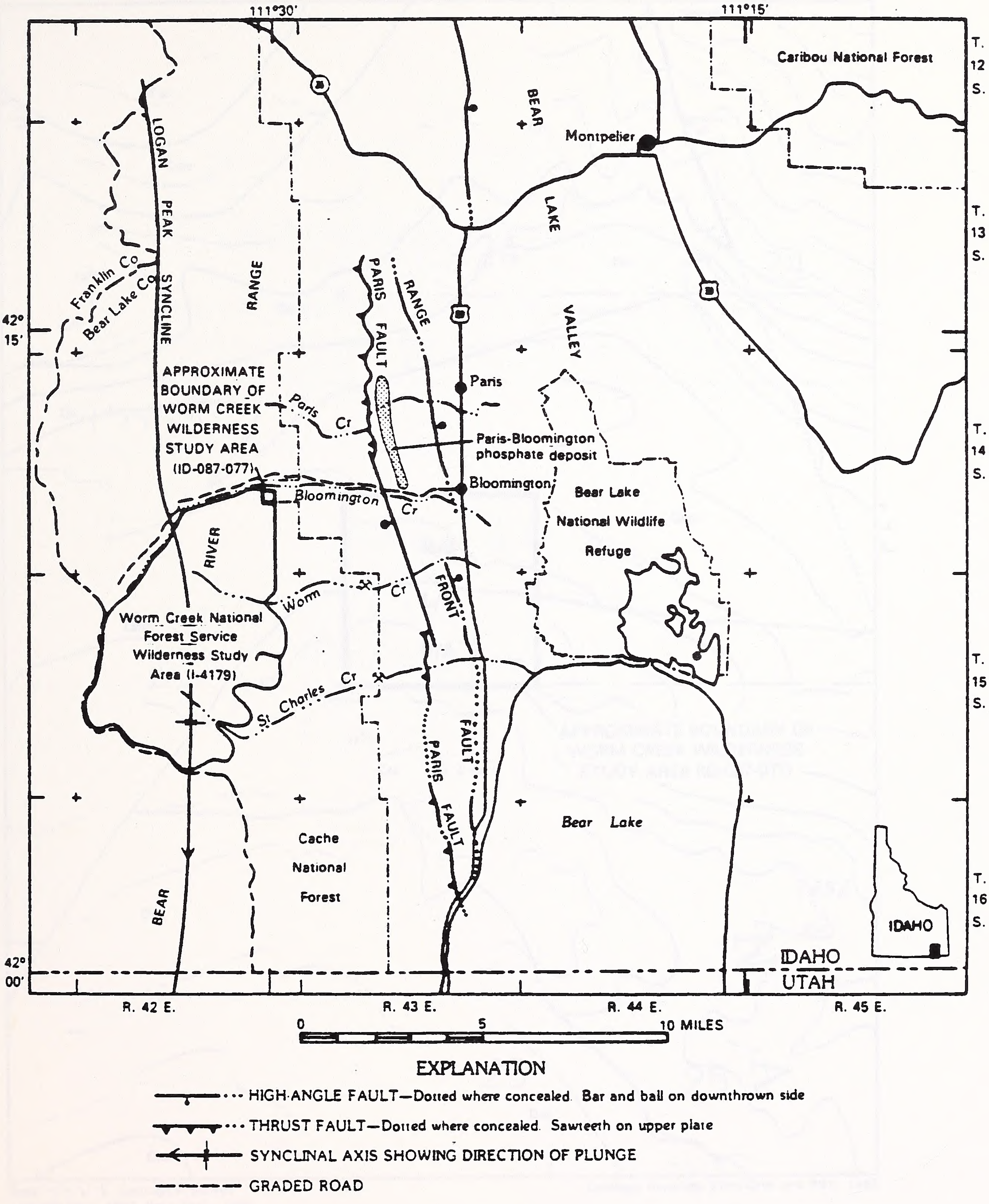
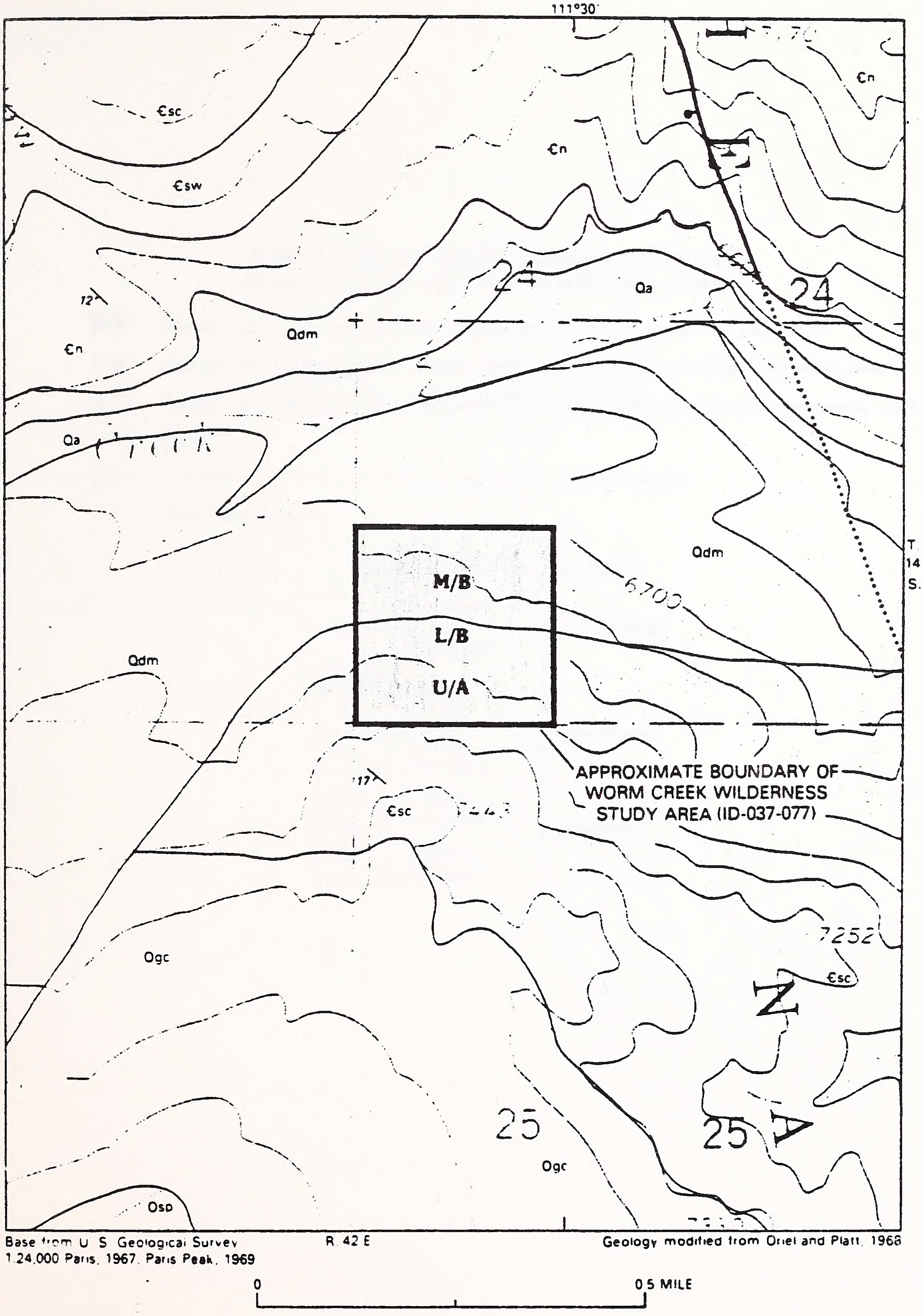

111°30'
111°15'
T. 12 S.
T. 13 S.
T. 14 S.
T. 15 S.
T. 16 S.
42° 15'
42° 00'
Caribou National Forest
Montpelier
BEAR LAKE VALLEY
LOGAN PEAK SYNCLINE
RANGE
PARIS FAULT
RANGE
Franklin Co
Bear Lake Co
APPROXIMATE BOUNDARY OF WORM CREEK WILDERNESS STUDY AREA (ID-087-077)
Paris Cr
Paris
Paris-Bloomington phosphate deposit
Bloomington
Bloomington Cr
Bear Lake National Wildlife Refuge
RIVER
Worm Cr
FRONT
Worm Creek National Forest Service Wilderness Study Area (I-4179)
St Charles Cr
FAULT
PARIS FAULT
Bear Lake
Cache National Forest
BEAR
IDAHO
IDAHO
UTAH
R. 42 E.
R. 43 E.
R. 44 E.
R. 45 E.
0
5
10 MILES
EXPLANATION
HIGH-ANGLE FAULT—Dotted where concealed. Bar and ball on downthrown side
THRUST FAULT—Dotted where concealed. Sawteeth on upper plate
SYNCLINAL AXIS SHOWING DIRECTION OF PLUNGE
GRADED ROAD

Figure 1. Index map of the Worm Creek Wilderness Study Area, Bear Lake County, Idaho, showing important geologic and topographic features.

Figure 3. Index map of the Horn Creek Wilderness Study Area, Butte County, Idaho, showing locations, geologic and topographic features.



Base from U. S. Geological Survey
1:24,000 Paris, 1967, Paris Peak, 1969

Geology modified from Oriel and Platt, 1968

Figure 2. Map showing mineral resource potential and geology of the Worm Creek Wilderness Study Area.

EXPLANATION OF MINERAL RESOURCE POTENTIAL

(All assessments of mineral resource potential apply to entire study area)

M/B	Geologic terrane having moderate energy resource potential for oil and gas, with certainty level B
L/B	Geologic terrane having low mineral resource potential for lead, silver, copper, and gold, with certainty level B
U/A	Geologic terrane having unknown mineral resource potential for phosphate and vanadium, with certainty level A
———	Contact
——•—— ···	High-angle fault—Dotted where concealed. Bar and ball on downthrown side
⊥ 12	Strike and dip of bedding

CORRELATION OF MAP UNITS

Qa	Holocene	QUATERNARY
Qdm	Pleistocene	
Unconformity		
Osp	Middle Ordovician	ORDOVICIAN
Ogc	Lower Ordovician	
€sc	Upper Cambrian	CAMBRIAN
€sw		
€n	Middle Cambrian	

Chapter B

Mineral Resources of the Eighteenmile Wilderness Study Area, Lemhi County, Idaho

By BETTY SKIPP, JERRY R. HASSEMER,
DOLORES M. KULIK, and DON L. SAWATZKY
U.S. Geological Survey

ANDREW M. LESZCYKOWSKI and RICHARD A. WINTERS
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1718

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
SOUTHEASTERN IDAHO

MINERAL RESOURCES OF WILDERNESS STUDY AREAS— SOUTHEASTERN IDAHO

Mineral Resources of the Eighteenmile Wilderness Study Area, Lemhi County, Idaho

By Betty Skipp, Jerry R. Hassemer,
Dolores M. Kulik, *and* Don L. Sawatzky,
U.S. Geological Survey, and

Andrew M. Leszcykowski *and* Richard A. Winters,
U.S. Bureau of Mines

ABSTRACT

At the request of the U.S. Bureau of Land Management, 18,700 acres of the Eighteenmile Wilderness Study Area (ID–043–003) were studied by the U.S. Bureau of Mines and the U.S. Geological Survey. In this report the area studied is called the "wilderness study area" or simply the "study area." There are no identified resources within the study area; however, according to a U.S. Bureau of Land Management examination report, there are approximately 13 million tons of gypsum reserves at the E.J. Wilson and Sons mine just outside the northwest boundary of the study area, on Clear Creek. The northern part of the study area has a moderate mineral resource potential for undiscovered deposits of hydrothermal gypsum in the Clear Creek area and a low potential for associated lead, silver, copper, molybdenum, and zinc in the vicinity of Clear Creek (fig. 1). The central part of the study area and other areas to the south underlain by the Jefferson Formation have a moderate mineral resource potential for undiscovered stratabound lead, zinc, and silver resources in dolomite of the Jefferson Formation. The southern part of the study area has a low potential for undiscovered silver, copper, lead, molybdenum, and zinc resources in fractures in the Beaverhead Mountains pluton and a low potential for tin, niobium, uranium, thorium, and rare-earth element resources in granites and sediments derived from the granites of the Beaverhead Mountains pluton. The northern part of the area has a low resource potential for undiscovered phosphate resources. The entire study area has a low and moderate potential, respectively, for undiscovered oil and gas at depths as great as 10,000 ft (feet) beneath the surface. An unknown potential for oil and gas exists below 10,000 ft.

SUMMARY

Character and Setting

The area studied is on the steep western flank of the central Beaverhead Mountains of east-central Idaho, 12 mi (miles) southeast of Leadore (fig. 2), in Lemhi County. Parts of the eastern border of the study area lie on the Continental Divide, along which peaks rise to more than 11,000 ft. Total maximum relief is about 4,000 ft. Access to the western side of the study area is provided by gravel roads that exit from paved Idaho State Highways 28 and 29.

The wilderness study area is within the Cordilleran overthrust belt, which has been pulled apart by extensional (normal) faults, some of which are still active. Thrust plates present in the area probably moved into place during Cretaceous time (for geologic ages, see geologic time chart on last page of report) along folded, low-angle, west-dipping thrust faults. The first normal faults formed between about 65 and 50 million years ago, and basin-range normal faults have been active ever since. The northwest-trending, narrow, high mountain ranges and intervening deep, elongate valleys that are characteristic of south-central Idaho and the study area were formed in the latest episode of basin-range extension.

Mineral Resource Potential

Middle and Late Proterozoic marine sedimentary rocks are exposed in two small areas in the wilderness study area, but no mineral deposits are known to be associated with them. Paleozoic sedimentary rocks make up the north half of the area and are present in limited outcrops along north-trending normal faults in the south half. They consist of

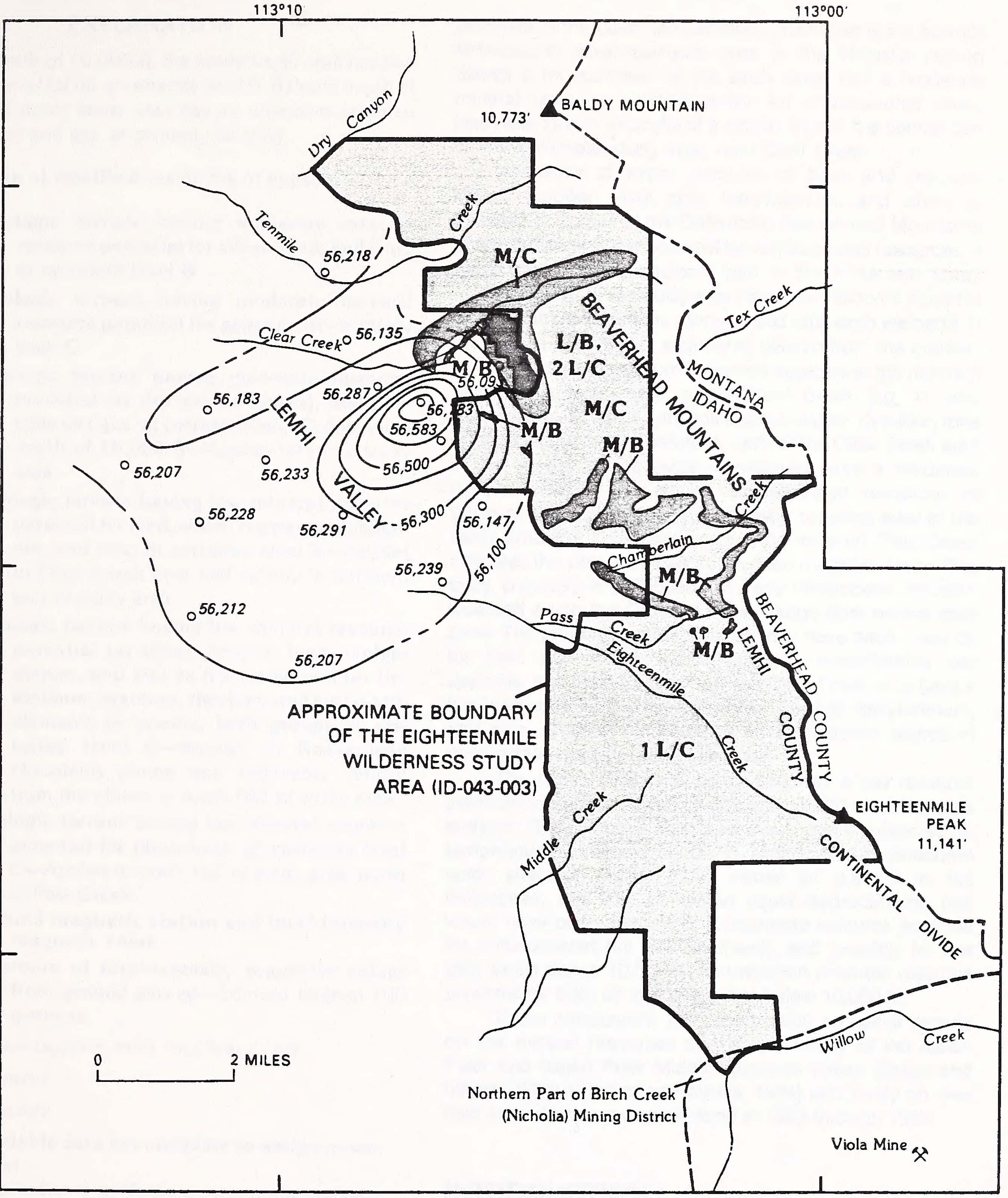


Figure 1 (above and facing page). Summary map showing identified resources, mineral resource potential, principal mines and prospects, and a local magnetic anomaly in the Eighteenmile Wilderness Study Area and vicinity, Lemhi County, Idaho.

Ordovician Kinnikinic Quartzite, Devonian Jefferson and Three Forks Formations, Mississippian McGowan Creek, Middle Canyon, Scott Peak, South Creek, Surrett Canyon, and Railroad Canyon Formations, Pennsylvanian to Mississippian Bluebird Mountain Formation, and Permian to Pennsylvanian Snaky Canyon Formation. The Permian Phosphoria Formation, which has been mined for phosphate 5 mi north of the study area, is not present in the study area. Scattered phosphate anomalies identified in the study area in other upper Paleozoic rocks are not indicative of a phosphate resource, and thus the northern part of the area has a low mineral resource potential for undiscovered phosphate.

EXPLANATION

[Down to a depth of 10,000 ft. the entire study area has low resource potential for oil. at certainty level D. Below a depth of 10,000 ft, the entire study area has an unknown resource potential for oil and gas. at certainty level A]

▨	Area of identified resources of gypsum
M/B	Geologic terrane having moderate mineral resource potential for silver, lead, and zinc, at certainty level B
M/C	Geologic terrane having moderate mineral resource potential for gypsum, at certainty level C
M/C	Geologic terrane having moderate resource potential for dry gas (methane), and possibly wet gas, at certainty level C, down to a depth of 10,000 ft—Applies to entire study area
L/B	Geologic terrane having low mineral resource potential for lead, silver, copper, molybdenum, and zinc, at certainty level B—Applies to Clear Creek area and vicinity in northern part of study area
1L/C	Geologic terrane having low mineral resource potential for silver, copper, lead, molybdenum, and zinc in fractures, and for tin, niobium, uranium, thorium, and rare-earth elements in granite, both groups at certainty level C—Applies to Beaverhead Mountains pluton and sediments derived from the pluton in south half of study area
2L/C	Geologic terrane having low mineral resource potential for phosphate, at certainty level C—Applies to north half of study area, north of Pass Creek
56,287 o	Ground magnetic station and total-intensity magnetic value
—56,300—	Contours of total-intensity magnetic values from ground survey—Contour interval 100 gammas
⚒	Mine—Gypsum mine on Clear Creek
×	Prospect

Levels of certainty

A	Available data not adequate to assign potential
B	Data indicate geologic environment and suggest level of resource potential
C	Data indicate geologic environment, but do not establish activity of resource-forming processes
D	Data define geologic environment and level of resource potential and indicate activity of resource-forming processes in all or part of the area

Dolomite of the Devonian Jefferson Formation is the host for stratabound silver-lead-zinc ores in the Nicholia mining district 2 mi southeast of the study area, and a moderate mineral resource potential exists for undiscovered silver, lead, and zinc in deposits of a similar type in the central part of the wilderness study area, near Clear Creek.

Presence of minor amounts of base and precious metals (copper, lead, zinc, molybdenum, and silver) in fractures in granite of the Ordovician Beaverhead Mountains pluton indicates a low potential for undiscovered resources of these metals in the southern part of the wilderness study area. That part of the study area has a low resource potential for tin, niobium, uranium, thorium, and rare-earth elements in the granite itself and in sediments derived from the granite.

A deposit of gypsum is present adjacent to the northern part of the study area, along Clear Creek (fig. 1), and according to the BLM contains approximately 13 million tons of gypsum reserves. Therefore, parts of the Clear Creek area in the vicinity of the gypsum reserves have a moderate mineral potential for similar, undiscovered resources of gypsum. A positive magnetic anomaly centered west of the study area (fig. 1) in the vicinity of the mine on Clear Creek indicates the presence of a subsurface magnetic body. The body probably is a Pliocene or early Pleistocene intrusion localized along the Crooked Creek range-front normal-fault zone. The proposed intrusive body may have been a source for heat and metals prerequisite to hydrothermal ore deposits, and, therefore, parts of the Clear Creek area have a low resource potential for lead, silver, copper, molybdenum, and zinc. There is no evidence for a Holocene source of geothermal energy in the study area.

The entire wilderness study area has a low resource potential for undiscovered oil down to 10,000 ft beneath the surface. Rocks above this level have been subjected to temperatures in excess of 100 °C, as indicated by conodont color alteration index (CAI) values of 2.5–4.5 in the limestones, and any contained liquid hydrocarbons (oil) would have been destroyed. A moderate resource potential for undiscovered dry gas (methane), and possibly for wet gas, exists above 10,000 ft. An unknown potential resource potential for both oil and gas exists below 10,000 ft.

These conclusions are based partly on earlier reports on the mineral resources and geochemistry of the Italian Peak and Italian Peak Middle Roadless Areas (Skipp and others, 1983; Hopkins and others, 1984) and partly on new field and laboratory studies done in 1983 through 1986.

INTRODUCTION

At the request of the U.S. Bureau of Land Management (BLM), 18,700 acres of the Eighteenmile Wilderness Study Area (ID–043–003) was studied by the U.S. Bureau of Mines and the U.S. Geological Survey. In this report the area studied is called the "wilderness study area" or simply the "study area." The study area lies along the steep western flank of the central Beaverhead Mountains. The northern border of the area is 12 mi southeast of Leadore, Idaho, and the area extends an

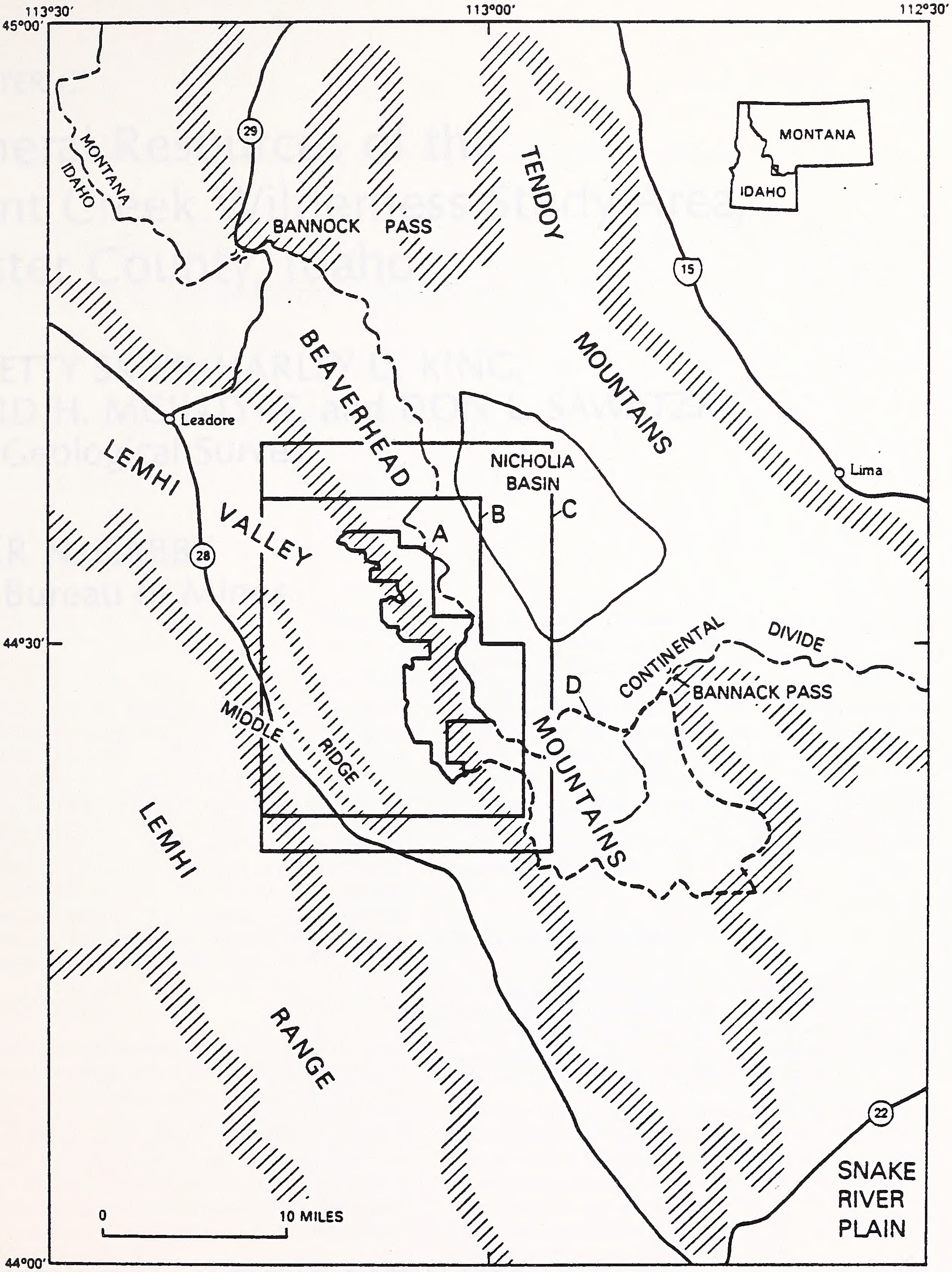


Figure 2. Index map showing (A) area of the Eighteenmile Wilderness Study Area, Lemhi County, Idaho; (B) area of figure 1 and plate 1, (C) area of figures 4, 5, and 6, and (D) approximate boundary of contiguous Italian Peak and Italian Peak Middle Roadless Areas.

CHAPTER C

Mineral Resources of the Burnt Creek Wilderness Study Area, Custer County, Idaho

By BETTY SKIPP, HARLEY D. KING,
DAVID H. MCINTYRE, and DON L. SAWATZKY
U.S. Geological Survey

PETER N. GABBY
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1718

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
SOUTHEASTERN IDAHO

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—SOUTHEASTERN IDAHO

Mineral Resources of the Burnt Creek Wilderness Study Area, Custer County, Idaho

By Betty Skipp, Harley D. King, David H. McIntyre, *and*
Don L. Sawatzky
U.S. Geological Survey, and

Peter N. Gabby,
U.S. Bureau of Mines

SUMMARY

Abstract

The Burnt Creek (ID–045–012) Wilderness Study Area lies in the Basin-and-Range province of east-central Idaho. The area has no identified mineral or energy resources. A high resource potential for undiscovered resources of high-calcium limestone suitable for the manufacture of Portland cement is present in three areas in the Upper Mississippian Surrett Canyon Formation and in one area in the Middle Pennsylvanian part of the Snaky Canyon Formation (fig. 1). The entire wilderness study area has low resource potential for undiscovered metals, oil and gas, and geothermal energy. Paleozoic limestone units have a low resource potential for undiscovered barite resources in veins.

Character and Setting

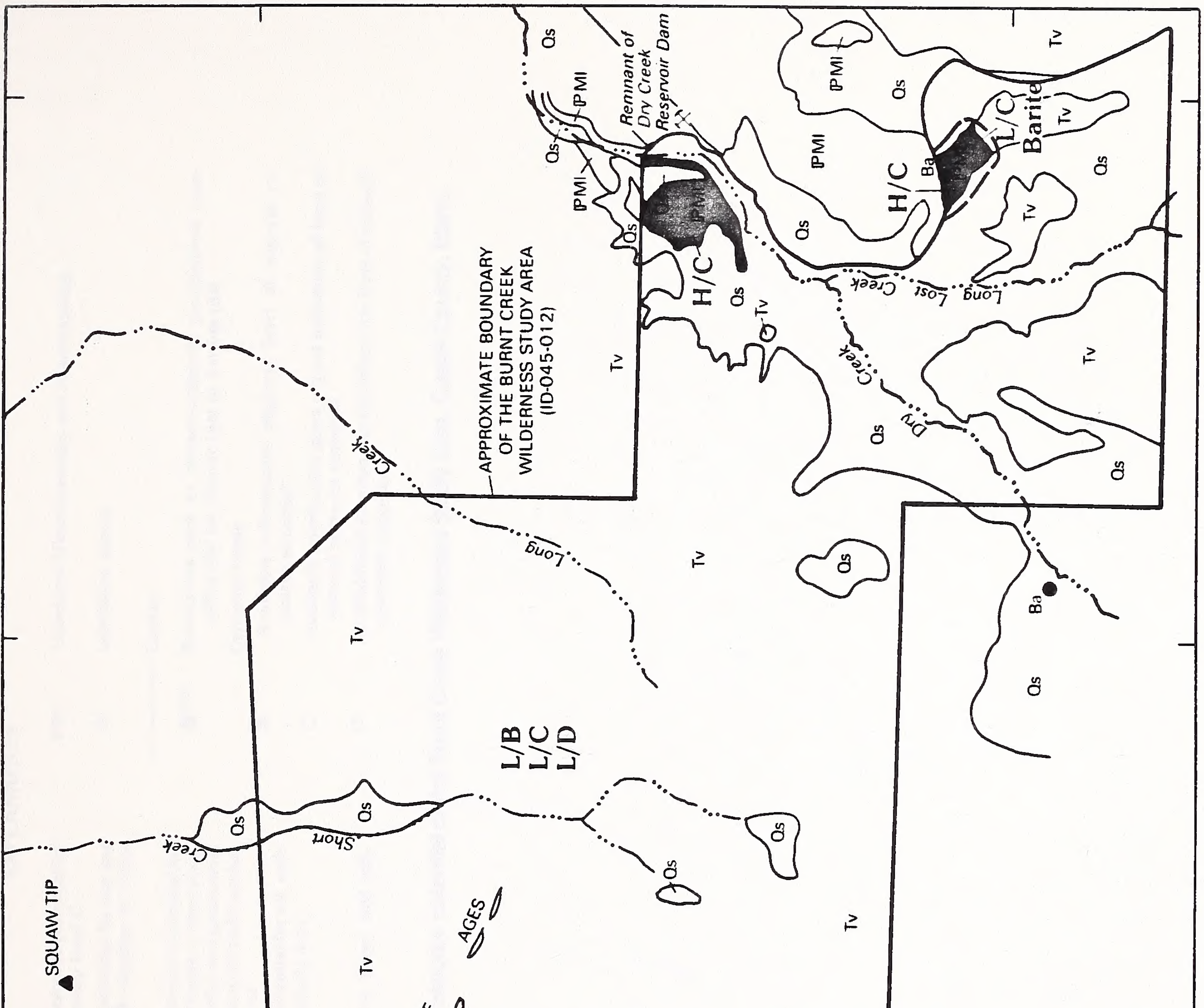
The Burnt Creek Wilderness Study Area lies at the head of the Pahsimeroi Valley on the northeastern slope of the Lost River Range, Custer County, Idaho. Elevations in the area, which includes parts of the Burnt Creek, Short Creek, Long Creek, and Dry Creek drainages (fig. 1), range from a high of 9,808 ft (feet) to a low of about 7,450 ft. Borah Peak, the highest point in Idaho (12,662 ft), is about 7 mi (miles) west of the study area (fig. 2), and Burnt Creek and Dry Creek have their origins in cirques and glacial valleys on the eastern side of the Lost River Range.

The wilderness study area is in the Mesozoic (see geologic time chart at the end of this report for geologic ages) Cordilleran thrust belt and the Neogene Basin-and-Range extensional province. Thrust plates in the area probably moved into place in Cretaceous time about 65 to 100 million years ago, along folded west-dipping thrust faults. Regionally, the first normal faults formed between 65 and 50 million years ago. The northwest-trending narrow, high mountain ranges and intervening deep, elongate valleys that are characteristic of south-central Idaho and the study area, however, developed largely during late Cenozoic basin-range normal faulting that culminated between 7 and 4 million years ago and has continued to the present time. Normal faults moved again on the western flank of the Lost River Range just west of the study area during the 1983 Borah Peak earthquake.

Mineral Resource Potential

A high mineral resource potential for limestone pure enough to be used in the manufacture of Portland cement is present in four small areas in the southeastern and southwestern parts of the study area in parts of the Surrett Canyon and Snaky Canyon Formations (pl. 1).

A low mineral resource potential for all metals is present in the andesite and rhyodacite plugs and sills that intrude the lower part of the Eocene Challis Volcanics and in the Paleozoic limestone units in the study area. No anomalous metal concentrations were identified by the geochemical survey, but isolated anomalous arsenic was noted at three sample sites. The potential for resources of metals is low throughout the study area. A low mineral resource potential also exists for barite in limestone, though anomalous barium was identified at two sample sites in the study area. Barite probably is locally present in small veins in the limestones.


113°32'30"
113°35'
113°37'30"
44° 10'
44° 07' 30"
APPROXIMATE BOUNDARY OF THE BURNT CREEK WILDERNESS STUDY AREA (ID-045-012)
Remnant of Dry Creek Reservoir Dam
Long Lost Creek
Dry Creek
Long Creek
Short Creek
ROCK OF AGES
SQUAW TIP
L/B
L/C
L/D
L/C Barite
H/C
Burnt Creek
Burnt Creek Lake
East Fork Burnt Creek
West Fork Burnt Creek
Qs
Tv
ⱣMI
As
Ba
0
1 MILE
IDAHO

EXPLANATION

H/C	Geologic terrane having high mineral resource potential for high-calcium limestone, with certainty level C
L/B	Geologic terrane having low resource potential for dry gas (methane), with certainty level B—Applies to entire study area
L/C	Geologic terrane having low mineral resource potential for all metals, geothermal energy, and barite in limestone, with certainty level C—Rating for metals and geothermal energy applies to entire study area; rating for barite applies only to areas outlined with dashed line
L/D	Geologic terrane having low resource potential for oil, with certainty level D—Applies to entire study area
Qs	Surficial deposits (Quaternary)
Tv	Challis Volcanics and associated dikes, plugs, and sills (Eocene)

PMl	Limestone (Pennsylvanian and Mississippian)
⚒	Limestone quarry
———	Contact
● As	Anomalous rock or stream-sediment geochemical sampling site for arsenic (As) or barium (Ba)
	Certainty levels
B	Available information suggests level of mineral resource potential
C	Available information gives a good indication of level of mineral resource potential
D	Available information clearly defines the level of mineral resource potential

Figure 1. Summary map showing mineral resource potential of the Burnt Creek Wilderness Study Area, Custer County, Idaho.

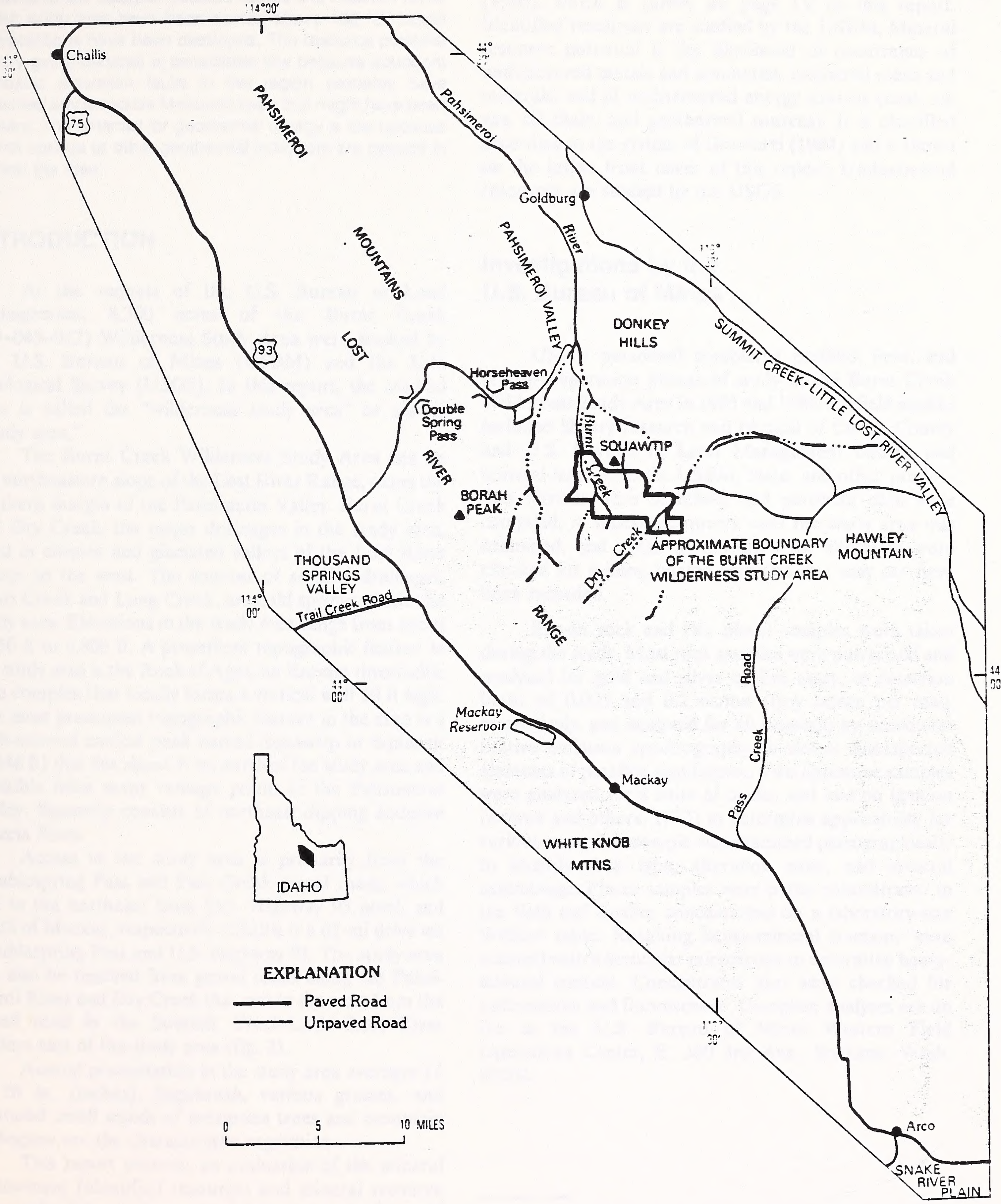


Figure 2. Index map showing location of the Burnt Creek Wilderness Study Area, Custer County, Idaho.

The energy resource potential for oil and gas is considered low because possible source and reservoir rocks in the study area have been heated above 180 °C. Liquid hydrocarbons have been destroyed. The resource potential for dry gas (methane) is considered low because abundant Cenozoic extension faults in the region probably have breached any favorable Mesozoic traps that might have been present. The potential for geothermal energy is low because no hot springs or other geothermal indicators are present in or near the area.

INTRODUCTION

At the request of the U.S. Bureau of Land Management, 8,300 acres of the Burnt Creek (ID–045–012) Wilderness Study Area were studied by the U.S. Bureau of Mines (USBM) and the U.S. Geological Survey (USGS). In this report, the studied area is called the "wilderness study area" or simply "study area."

The Burnt Creek Wilderness Study Area lies on the northeastern slope of the Lost River Range, along the southern margin of the Pahsimeroi Valley. Burnt Creek and Dry Creek, the major drainages in the study area, head in cirques and glaciated valleys of the Lost River Range to the west. The sources of smaller drainages, Short Creek and Long Creek, are cold springs within the study area. Elevations in the study area range from about 7,450 ft to 9,808 ft. A prominent topographic feature in the study area is the Rock of Ages, an Eocene rhyodacitic dike complex that locally forms a vertical wall 50 ft high. The most prominent topographic feature in the area is a dark-colored conical peak named Squawtip or Squawtit (9,046 ft) that lies about ¾ mi north of the study area and is visible from many vantage points in the Pahsimeroi Valley. Squawtip consists of northeast-dipping andesite breccia flows.

Access to the study area is primarily from the Doublespring Pass and Pass Creek gravel roads, which exit to the northeast from U.S. Highway 93 north and south of Mackay, respectively. Challis is a 62-mi drive via Doublespring Pass and U.S. Highway 93. The study area can also be reached from gravel roads along the Pahsimeroi River and Dry Creek that exit to the west from the paved road in the Summit Creek-Little Lost River Valleys east of the study area (fig. 2).

Annual precipitation in the study area averages 16 to 20 in. (inches). Sagebrush, various grasses, and scattered small stands of evergreen trees and mountain mahogany are the characteristic vegetation.

This report presents an evaluation of the mineral endowment (identified resources and mineral resource potential) of the study area and is the product of several separate studies by the USBM and the USGS. Identified resources are classified according to the system of the U.S. Bureau of Mines and U.S. Geological Survey (1980), which is shown on page IV of this report. Identified resources are studied by the USBM. Mineral resource potential is the likelihood of occurrence of undiscovered metals and nonmetals, industrial rocks and minerals, and of undiscovered energy sources (coal, oil, gas, oil shale, and geothermal sources). It is classified according to the system of Goudarzi (1984) and is shown on the inside front cover of this report. Undiscovered resources are studied by the USGS.

Investigations by the U.S. Bureau of Mines

USBM personnel completed prefield, field, and report-preparation phases of study of the Burnt Creek Wilderness Study Area in 1985 and 1986. Prefield studies included library research and perusal of Custer County and U.S. Bureau of Land Management mining and mineral-lease records. USBM, State, and other production records were searched, and pertinent data were compiled. A limestone quarry near the study area was examined, and areas of obvious rock alteration were checked for mining-related activities that may not have been recorded.

Eleven rock and two placer samples were taken during the study. Most rock samples were pulverized and analyzed for gold and silver by fire assay, at detection limits of 0.005 and 0.2 oz/ton (troy ounce per ton), respectively, and analyzed for 40 elements by semiquantitative emission spectrography to detect unsuspected elements of possible significance. Two limestone samples were analyzed for a suite of oxides and loss on ignition (Bowen and others, 1973) to determine applicability for various uses. One sample was examined petrographically to identify rock type, alteration suite, and mineral assemblage. Placer samples were partly concentrated in the field and further concentrated on a laboratory-size Wilfley[1] table. Resulting heavy-mineral fractions were scanned with a binocular microscope to determine heavy-mineral content. Concentrates also were checked for radioactivity and fluorescence. Complete analyses are on file at the U.S. Bureau of Mines Western Field Operations Center, E. 360 3rd Ave., Spokane, Wash. 99202.

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[1] Use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Bureau of Mines or U.S. Geological Survey.

Mineral Resources of the Jerry Peak, Jerry Peak West, and Boulder Peak Wilderness Study Areas, Custer County, Idaho

by D.H. McIntyre and F.L. Johnson

SUMMARY

The Jerry Peak (ID-046-014), Jerry Peak West (ID-046-014A), and Boulder Creek (ID-046-013) Wilderness Study Areas are in Custer County, Idaho, about 25 miles south of the town of Challis, chiefly within the drainage basin of the East Fork Salmon River. The terrain within the study areas is moderately rugged; local relief approaches 2,000 ft.

Geology

The oldest rocks exposed in the study areas are Paleozoic sedimentary rocks. These are overlain by a sequence of volcanic rocks that are a part of the Eocene Challis Volcanics. The volcanic rocks, which blanket most of the study areas, are dominated by lavas and associated pyroclastic rocks, both of intermediate composition. The Paleozoic rocks are complexly folded and cut by thrust faults. They are also cut by high-angle faults that offset the Eocene volcanic rocks.

Mining History

There is no record of mineral production or development for any of the study areas. Only a few claims, probably less than ten, have been located in the study areas. Brecciated, limonitic jasperoid in the eastern part of the

Jerry Peak Wilderness Study Area has been explored by means of one 20-ft-long adit and one prospect pit. No significant concentration of metallic minerals was noted. Workings on several mining claims 0.5 mi north of the Jerry Peak West Wilderness Study Area expose quartz lenses and pods in Paleozoic sedimentary rocks. The quartz is malachite-stained and contains chalcopyrite (both copper-bearing minerals). The lenses and pods are clustered near a fault; however, the fault does not continue into the wilderness study area.

Geophysics

A detailed analysis of gravity and aeromagnetic surveys of the Jerry Peak Wilderness Study Area was carried out in 1983. The study provided thickness estimates for the principal geologic units and defined the principal major basement structures, most of which trend northwest. The geophysical data give no indication of any large, buried intrusions beneath the study area. Similar studies were not carried out in the other two study areas.

Geochemistry

Stream-sediment samples were collected from 118 locations in the three study areas. At many of these locations panned concentrates were also collected, from which the nonmagnetic heavy-mineral fractions were prepared. All samples were analyzed by semiquantitative methods for 31 elements.

Several samples from streams draining areas underlain by Paleozoic sedimentary rocks contained barium in amounts in excess of 5,000 parts per million. The most prominent occurrences are in the area underlain by limestone near the eastern boundary of the Jerry Peak Wilderness Study Areas.; samples collected there contained visible barite crystals. The crystalline barite may have been derived from small veins in the limestone. A large,

undiscovered deposit of barite in this area is possible, but unlikely. A careful search for barite veins or bedded barite in this area was unsuccessful.

The other occurrence of high barium in the stream-sediment samples is associated with the Paleozoic sedimentary rocks exposed in the Jerry Peak West Wilderness Study Area. Bedded barite is known to occur within the Salmon River sequence elsewhere in the region, so it is possible that a deposit of this kind could be present within the exposures of this unit in the Jerry Peak West Wilderness Study Area.

Mineral Resource Potential

A moderate resource potential for barite is assigned to the area underlain by Paleozoic sedimentary rocks near the eastern boundary of the Jerry Peak Wilderness Study Area and the area of Paleozoic sedimentary rocks in the Jerry Peak West Wilderness Study Area where rocks of the Salmon River sequence crop out. However, no outcrops of barite-enriched rocks were noted.

Evidence of metallic mineralization is lacking in all three wilderness study areas. Minor occurrences of copper-bearing rocks are exposed in prospects about 0.5 mi north of the Jerry Peak West Wilderness Study Area. No similar occurrences were found within the study area, nor does the mineral-bearing structure extend into the study area. Analytical results of stream-sediment and rock geochemistry do not indicate the presence of any metal anomalies associated with the Paleozoic rocks in the study area. A low resource potential for metals is assigned to the study areas.

Most of the Jerry Peak Wilderness Study Area and some of the Jerry Peak West Wilderness Study Area have been leased for oil and gas exploration; however significant oil and gas occurrences are unlikely. The Paleozoic

sedimentary rocks, the most likely targets for oil and gas exploration, are complexly folded and faulted. In addition, heating of these rocks during the Eocene volcanism, accompanied and followed by high-angle faulting, probably drove off or destroyed such oil and gas that may have accumulated.

Construction materials of suitable quality and quantity may be found in the area, but transportation costs to major markets far exceed the value of these materials; equally suitable materials are more readily accessible elsewhere.

M/B Areas with moderate potential for barite with certaintly level B

L/C Areas with low potential for metals, oil and gas, and construction materials, with certaintly level C

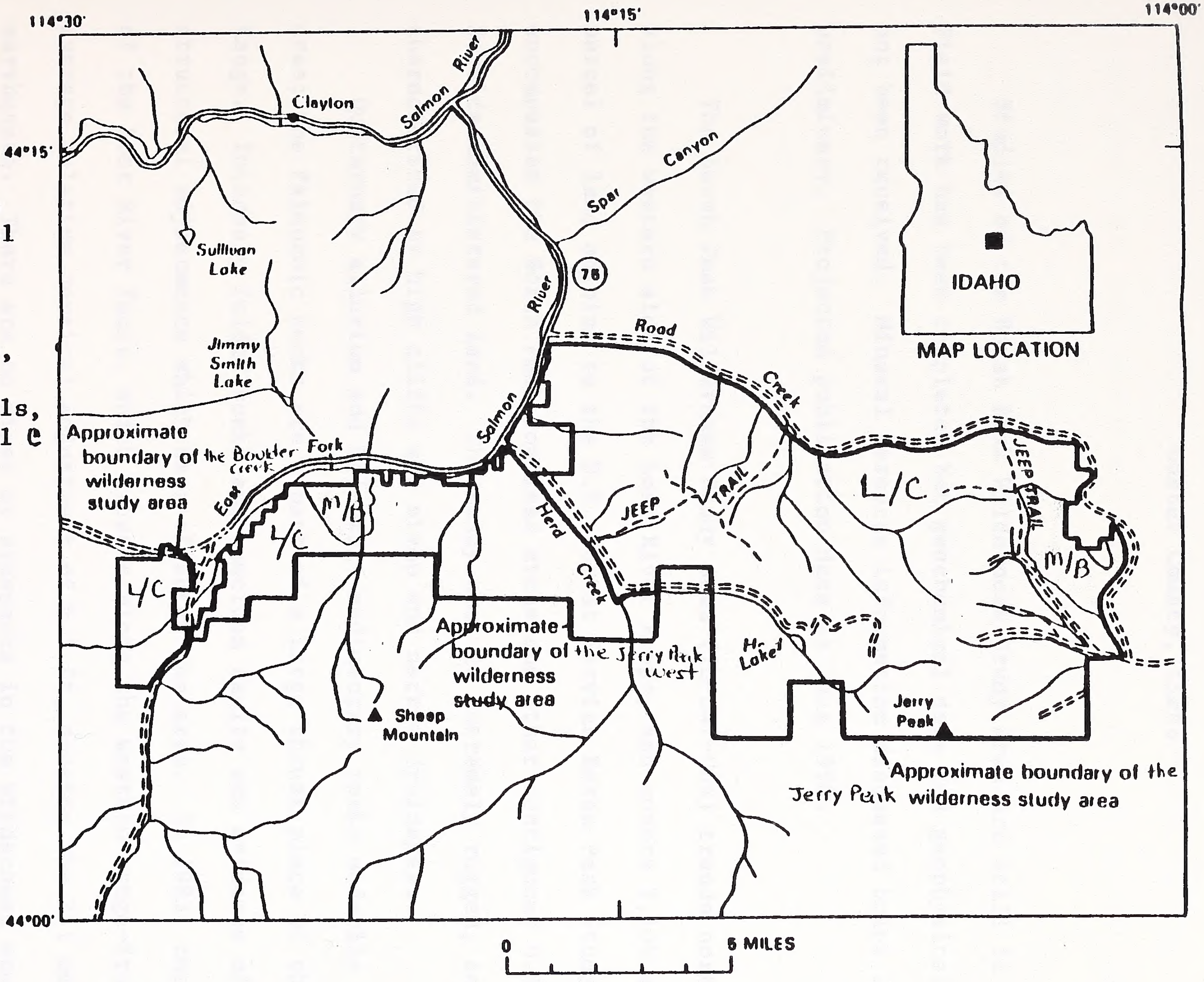


Figure 1.--Map showing mineral resource potential and locations of the Boulder Creek, Jerry Peak West, and Jerry Peak Wilderness Study Areas.

Mineral Resources of the Borah Peak Wilderness Study Area, Custer County, Idaho

Studies of the Borah Peak Wilderness Study Area are still in progress. Field work has been completed but geochemical data and geophysical data have not been received. Mineral resource information discussed below is preliminary. Projected publication date is June 1990.

The Borah Peak Wilderness Study Area (ID-047-004) trends north-northwest along the western side of the Lost River Range, and covers 3,100 acres. The parcel of land adjoins to the U.S. Forest Service Borah Peak Study Area, which encompasses the Borah Peak roadless areas and other contiguous U.S. Forest Service administered land. The study area is extremely rugged, and is characterized by high cliffs and steep and narrow drainages.

Quaternary alluvium and Paleozoic sedimentary rocks underlie the study area; the Paleozoic rocks are a part of a large thrust plate of the Lost River Range. Intensely folded rocks and numerous faults are evidence of the structural adjustments which have affected the area. In 1983, the east side of the Lost River Fault, which extends along the western range-front, made an average relative vertical adjustment of 6.5 ft, causing the 7.1 magnitude earthquake. There are no mines or prospects in the wilderness study area, although minor production of lead and zinc has occurred from two nearby mines. Field studies did not locate any mineralized rocks nor determine any areas likely for the generation of mineral deposits. The resource potential for metals is therefore given a preliminary rating of low; this may be modified when the geochemical work is completed. Although source rocks for

oil and gas may be present in the subsurface, the extensive amount of faulting and structural deformation make it likely that any hydrocarbons present would have been since been destroyed. The potential for oil and gas is therefore rated to be low.

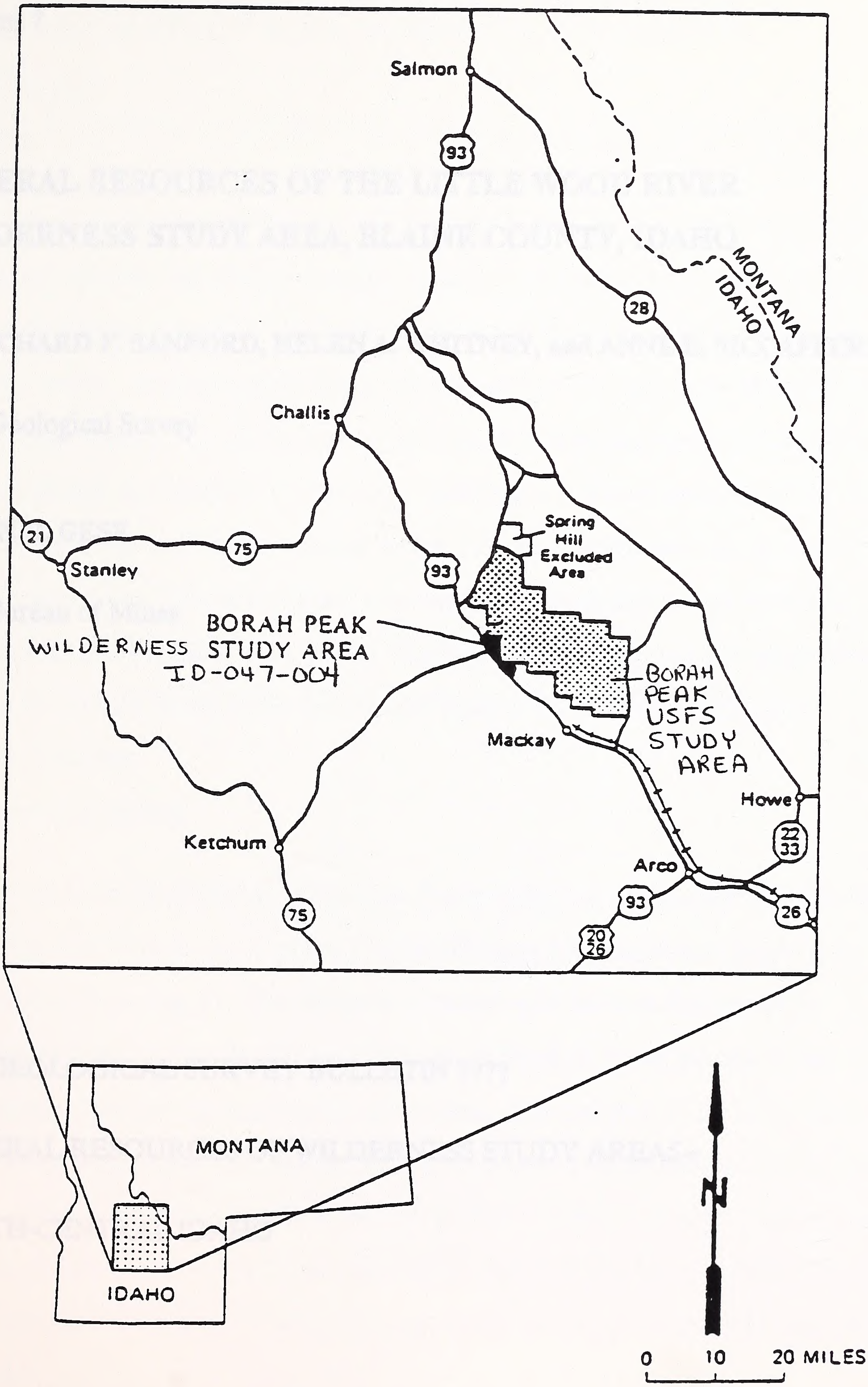


FIGURE 1.– Location of the Borah Peak study area, Custer County, ID

Chapter ?

MINERAL RESOURCES OF THE LITTLE WOOD RIVER WILDERNESS STUDY AREA, BLAINE COUNTY, IDAHO

By RICHARD F. SANFORD, HELEN A. WHITNEY, and ANNE E. MCCAFFERTY

U.S. Geological Survey

DIANN D. GESE

U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN ????

MINERAL RESOURCES OF WILDERNESS STUDY AREAS--

SOUTH-CENTRAL IDAHO

MINERAL RESOURCES OF THE LITTLE WOOD RIVER WILDERNESS STUDY AREA, BLAINE COUNTY, IDAHO

SUMMARY

Abstract

The U.S. Geological Survey (USGS) and the U.S. Bureau of Mines (USBM) studied the mineral and energy resource potential (undiscovered) and the identified mineral resources (known) of the Little Wood River Wilderness Study Area (ID-053-004), Idaho. The study area has moderate mineral resource potential for silver, barite, copper, lead, zinc, gold, and tungsten in epithermal quartz-carbonate veins in areas underlain by Paleozoic sedimentary rocks (fig. 1). The remainder of the area, which is underlain by Tertiary volcanic rocks, has low mineral resource potential for these commodities. The entire study area has low mineral and energy resource potential for other metals, sand, gravel, building materials, oil, gas and geothermal energy. The Little Wood River Wilderness Study Area contains no identified mineral resources.

Character and setting

The Little Wood River Wilderness Study Area is in south-central Idaho east of the Big Wood River, south of the Boulder-Pioneer Mountains and north of the Snake River Plain (fig. 2). The Wilderness Study Area borders the Sawtooth National Forest and Boulder-Pioneer Wilderness Study Area on the north and borders state and private land on the other sides. The margins of the Little Wood River Wilderness Study Area can be reached by a gravel road along the Little Wood River and by 4-wheel drive trails at the east and west ends of the area (plate 1). Altitude ranges from 5600 ft in the valley of the Little Wood River to 8000 ft in the northwest part of the area. The terrain is generally steep and covered by sagebrush and grass.

Geologically, the Wilderness Study Area is in an area of complexly folded and thrusted Paleozoic sediments that are overlain by Eocene volcanic rocks. Sandstones, calcareous sandstones, and quartzites of the Wood River Formation form resistant ridges and hills that make up most of the Wilderness Study Area. A relatively small area of Devonian Milligen Formation argillite underlies these rocks. Lavas and tuff-breccias of the Challis volcanics lap onto these Paleozoic rocks generally around the margins of the Wilderness Study Area. Quartz and calcite veins in the Paleozoic rocks appear to be associated with low-grade metamorphism and are rarely mineralized. Quartz and calcite vug fillings and veins in the volcanic rocks appear to be associated with shallow circulation of heated groundwater and are not mineralized.

The Wilderness Study Area is situated among several mining districts (fig. 2). The combined production of these districts was about $65 million (Simons, 1981) (about $400 million after adjusting for inflation), most of which came from the Mineral Hill and Alder Creek districts (Ross, 1941). Commodities produced varied with district and include silver, gold, copper, lead, zinc, barite,and tungsten. The closest district to the Wilderness Study Area is the Muldoon (or Little Wood River) district, about 4 miles to the east, which produced more than $200,000 ($1.2 million after adjusting for inflation), mostly in silver, lead, zinc, copper, and barite (Ross, 1941).

Identified mineral resources

No mineral resources were identified within the study area. A prospect in a quartz-carbonate vein 1.4 mi northwest of the study area contains anomalous concentrations of silver, barium, copper, lead, and zinc. However,the vein structure does not extend into the study area.

Mineral and energy resource potential

Quartz and quartz-carbonate veins and pods are common in the Devonian Milligen and Pennsylvanian-Permian Wood River Formations in the study area. These deposits are locally enriched in silver, barium, copper, lead, and zinc and resemble deposits in Paleozoic rocks in neighboring mining districts. The mineral resource potential for silver, barite, copper, lead, zinc, gold, and tungsten in epithermal deposits is considered to be moderate with certainty level B (fig. 1). Sand and gravel occur in small amounts in the study area, but larger quantities are available closer to populations centers. The Tertiary volcanic rocks in the study area are unsuitable as a source of building materials such as building stone, pumice, and diatomite. The mineral resource potential for sand, gravel, and building materials is low with a certainty level of C. Source rocks and structure are favorable for the generation, transport, and trapping of oil and natural gas, however, the temperatures reached by the rocks during deformation were probably too high for the retention of fluid hydrocarbons. Therefore, the energy resource potential for oil and gas is low, and the certainty level is C. Geothermal energy sources are common in the central Idaho region, however, no hot springs nor wells are known in the study area, and the energy resource potential for geothermal energy is low with a certainty level of B.

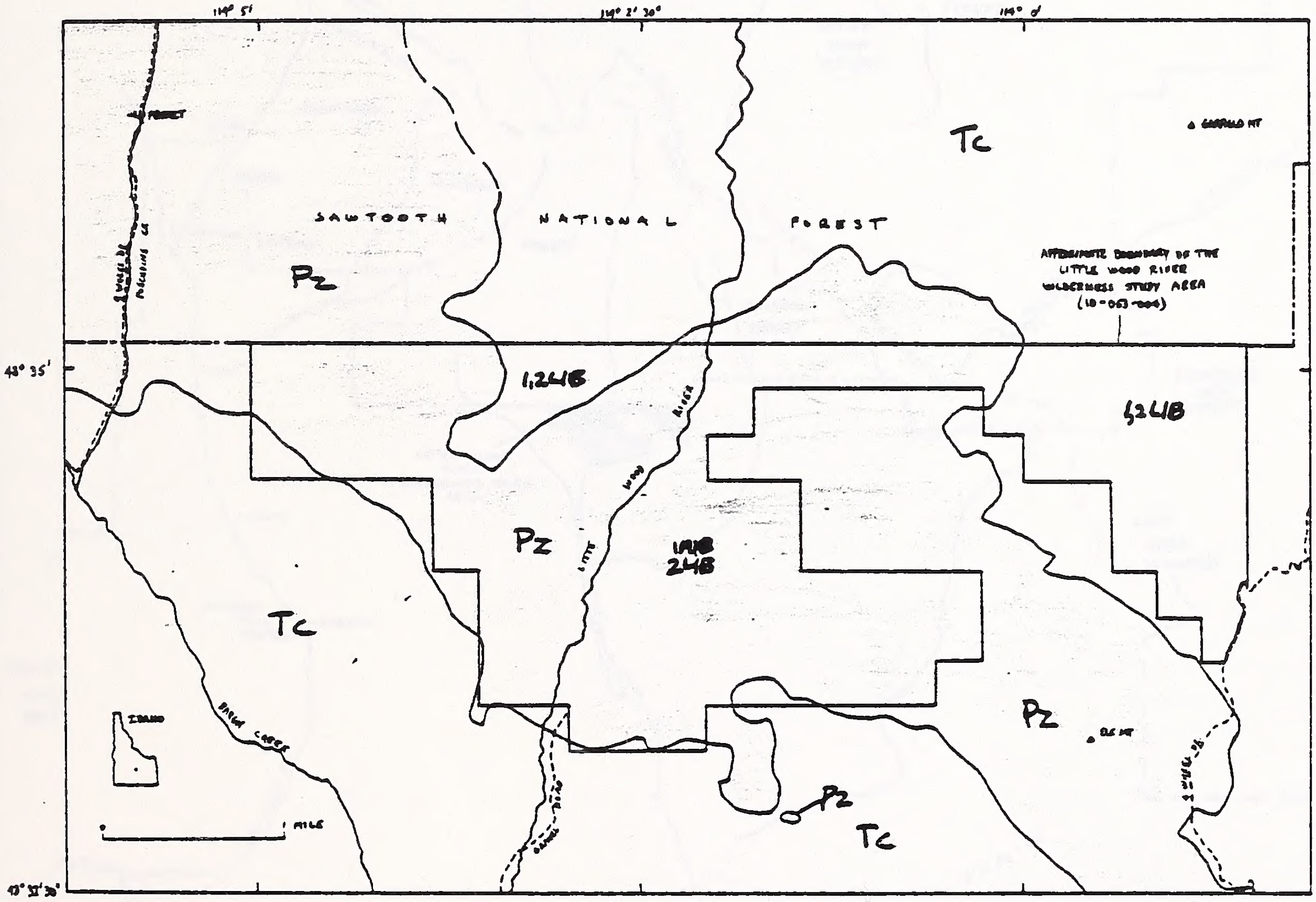
INTRODUCTION

The Little Wood River Wilderness Study Area (ID-053-004) comprises 4,385 acres in Blaine County, south-central Idaho (fig. 2). In this report, the studied area is called "Wilderness Study Area" or simply "study area." The Wilderness Study Area borders the Sawtooth National Forest and Boulder-Pioneer Wilderness Study Area on the north and borders state and private land on the other sides. The boundaries of the Wilderness Study Area can be reached by a gravel road along the

EXPLANATION

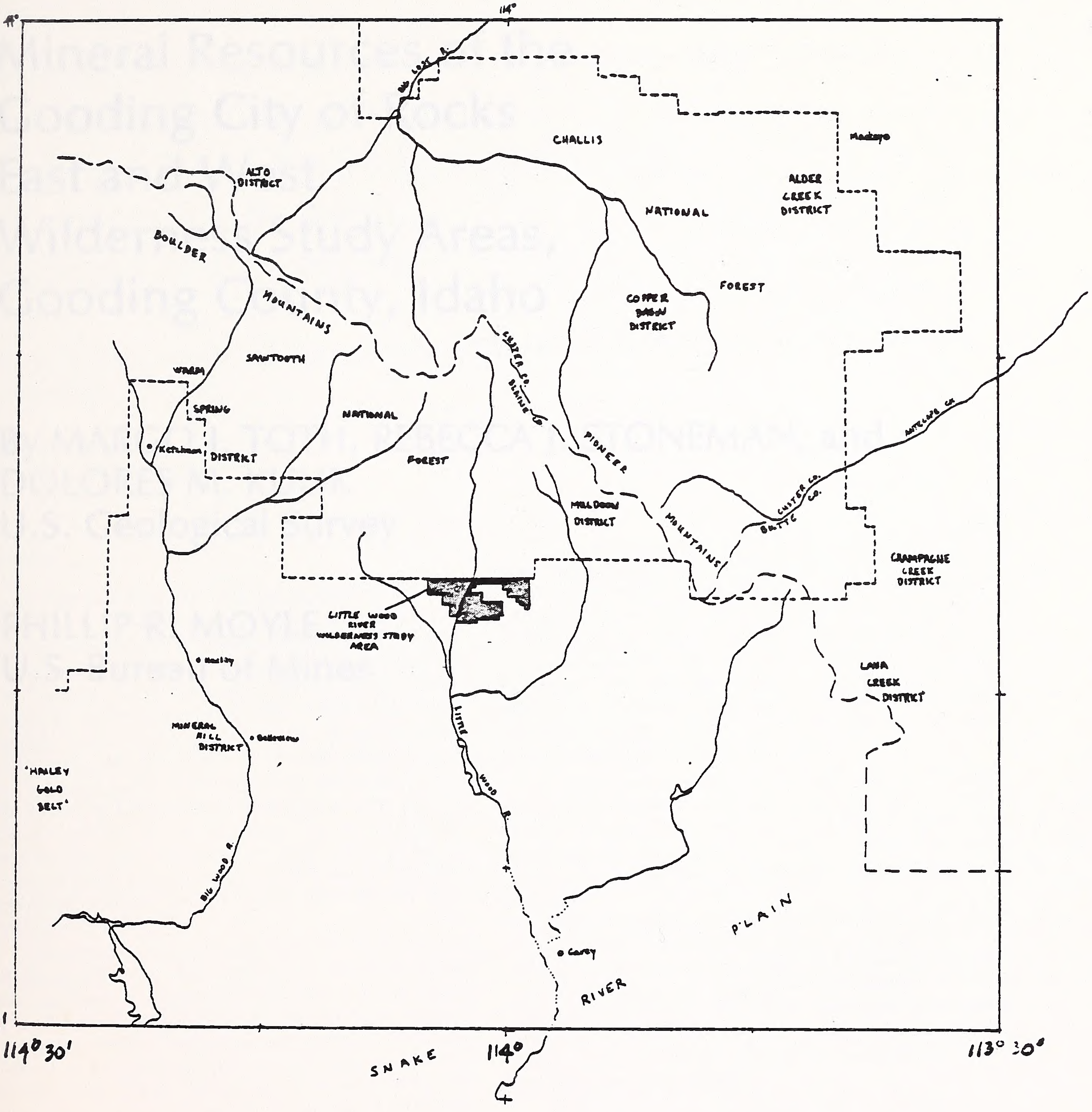
Fig. 1

1 M/B	Geologic terrane having moderate potential for silver, gold, lead, zinc, copper and tungsten, with certainty level B
1 L/B	Geologic terrane having low potential for silver, gold, lead, zinc, copper, and tungsten, with certaintly level B
2 L/B	Geologic terrane having a low potential for oil and gas, with certainty level B



Tc	Challis volcanics
Pz	Paleozoic rocks

Fig. 2


44°
114°
BIG LOST R.
ALTO DISTRICT
BOULDER MOUNTAINS
CHALLIS NATIONAL FOREST
Mackay
ALDER CREEK DISTRICT
COPPER BASIN DISTRICT
SAWTOOTH NATIONAL FOREST
WARM SPRING DISTRICT
Ketchum
CUSTER CO.
BLAINE CO.
PIONEER MOUNTAINS
MULDOON DISTRICT
ANTELOPE CK.
CUSTER CO.
BUTTE CO.
CHAMPAGNE CREEK DISTRICT
LITTLE WOOD RIVER WILDERNESS STUDY AREA
Hailey
MINERAL HILL DISTRICT
Bellevue
'HAILEY GOLD BELT'
BIG WOOD R.
LITTLE WOOD R.
LAVA CREEK DISTRICT
Carey
SNAKE RIVER PLAIN
43°15'
114°30'
114°
113°30'

Chapter A

Mineral Resources of the Gooding City of Rocks East and West Wilderness Study Areas, Gooding County, Idaho

By MARGO I. TOTH, REBECCA J. STONEMAN, and
DOLORES M. KULIK
U.S. Geological Survey

PHILLIP R. MOYLE
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1721

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
SOUTH-CENTRAL IDAHO

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—SOUTH-CENTRAL IDAHO

Mineral Resources of the Gooding City of Rocks East and West Wilderness Study Areas, Gooding County, Idaho

By Margo I. Toth, Rebecca J. Stoneman, *and* Dolores M. Kulik
U.S. Geological Survey

Phillip R. Moyle
U.S. Bureau of Mines

SUMMARY

In 1984 and 1985, the U.S. Geological Survey and U.S. Bureau of Mines undertook a joint investigation to assess the potential for undiscovered mineral resources and to appraise the identified resources of 19,030 acres of the Gooding City of Rocks East (ID–54–8a) and Gooding City of Rocks West (ID–54–8b) Wilderness Study Areas (fig. 1). Both study areas have low resource potential for metals, oil, gas, and coal; the potential for geothermal energy is moderate. Much of the western part of the Gooding City of Rocks West study area and the southwest corner of the Gooding City of Rocks East study area has high potential for diatomite (fig. 2). To the west of study area ID–54–8b, the Clover Creek diatomite deposit contains an inferred marginal reserve of 35 million tons of diatomite.

The Gooding City of Rocks East and Gooding City of Rocks West Wilderness Study Areas are 15 mi (miles) north-northwest of Gooding, in Gooding County, Idaho. The study areas are bounded on the northern, eastern, and southern sides by four-wheel-drive roads; study area ID–54–8b is bounded on the western side by the East Fork of Clover Creek. Access is provided by those dirt roads that are passable except during heavy rains and spring thaw. The two wilderness areas contain six deeply incised canyons separated by basalt-covered plateaus. Each canyon is characterized by a central deep, narrow stream having very few tributaries. Steep gorges are developed within most of the canyons, and the resulting landscape is one of spectacular arches, pillars, and sculptured rock.

The Gooding City of Rocks East and West Wilderness Study Areas are on the northern edge of the Snake River Plain, south of the Idaho batholith. The Miocene Idavada Volcanics (see geologic time chart in appendix) is the oldest unit that crops out in the two areas. It consists of as much as 300 ft (feet) of dacite to rhyolite ash-flow tuff. The Idavada Volcanics is overlain either by diatomite and related sedimentary deposits or by vesicular basalt of the Banbury Basalt; the basalt is as thick as a few hundred feet in some places.

North of the study areas, high-angle faulting has resulted in as much as 9,000 ft of displacement since early Pliocene. Within the study areas steep normal dip-slip faults are common, but offsets average only 30–50 ft; no mineralized rock was observed along any of the faults.

Gravity measurements within the study areas show little variation. Lower gravity values to the north are associated with sedimentary rocks, and higher gravity values to the south are associated with basaltic rocks of the Snake River Plain. The various rock types in the study areas are not delineated by the gravity data; nor are any of the faults expressed. Offsets on the faults are therefore probably only minor.

Forty-two placer claims within and adjacent to study area ID–54–8b cover the Clover Creek diatomite deposit. There has been minor production from four pits. Five exposures (or blocks) containing 416 million tons of diatomaceous material make up the Clover Creek deposit; four of the blocks are in the study areas, but are predominantly covered by basalt. The North Clover

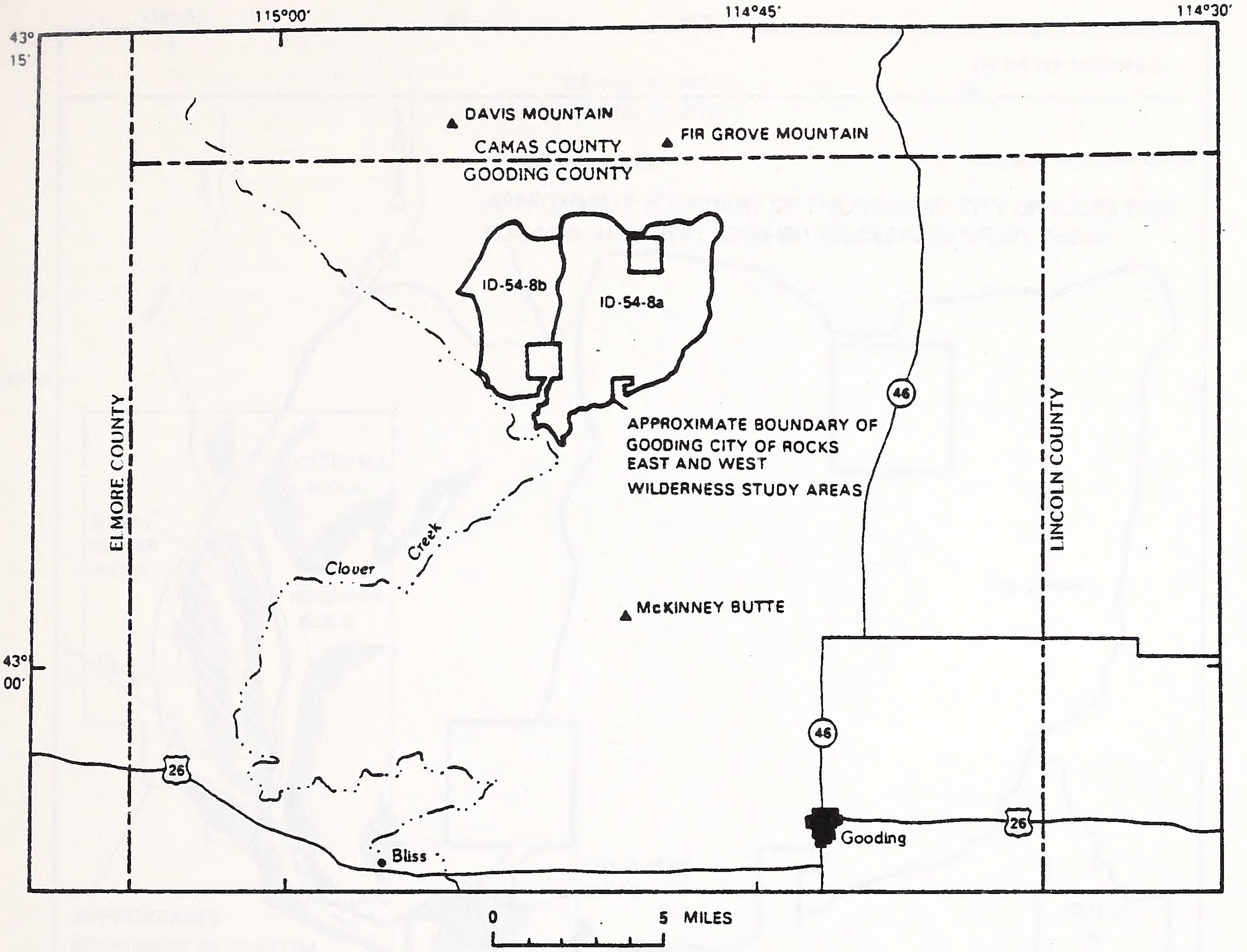


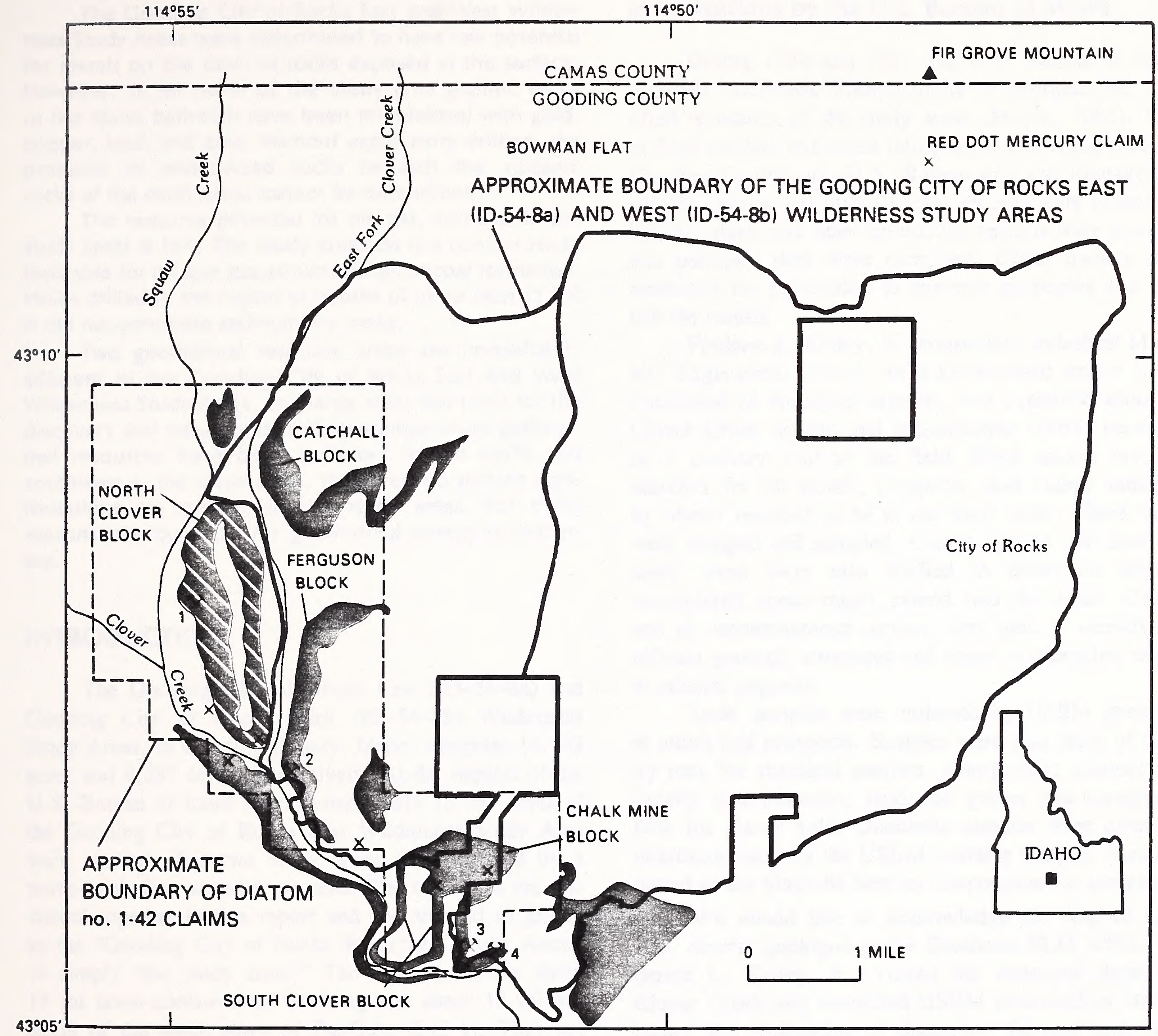
Figure 1. Index map showing the location of the Gooding City of Rocks East and West Wilderness Study Areas, Gooding County, Idaho.

block, just west of study area ID–54–8b, is only partly capped and could be mined by open-pit methods on the western flank of the exposure. The minable wedge contains an inferred marginal reserve (see resource/reserve classification chart in appendix) of 35 million tons of diatomite possibly suitable for filter aid, filler, insulation, and other applications. The resource is classified as marginal because products from it may be inferior to currently marketed diatomite products.

Several occurrences of platy welded tuff, possibly suitable as decorative stone, are in the study areas; however, abundant deposits to the east of the study areas could be more easily developed. Deposits of sand and gravel are too distant from markets, and there is little chance of development.

No mineralized rock was identified in the study areas. Abundant fragments of jasper were found in the eastern part of area ID–54–8b, but the source was not located. Chemical analyses of rock samples from a small prospect pit just to the north of study area ID–54–8a revealed no anomalous concentrations of any elements.

Figure 2 (facing page). Mineral resource potential map of the Gooding City of Rocks East and West Wilderness Study Areas, Gooding County, Idaho. Both study areas have low potential for metals, with certainty level B, and for oil, gas, and coal, with certainty level C. Both study areas also have moderate resource potential for geothermal energy, with certainty level B.



EXPLANATION

▨ **Area of identified diatomite resources**

▩ **Geologic terrane having high mineral resource potential for diatomite, with certainty level C**

⚒ **Diatomite mine**

1. **North pit mine**
2. **Middle pit mine**
3. **Chalk mine**
4. **Unnamed mine**

× **Prospect**

The Gooding City of Rocks East and West Wilderness Study Areas were determined to have low potential for metals on the basis of rocks exposed at the surface. However, 16 mi north of the study area granitic rocks of the Idaho batholith have been mineralized with gold, copper, lead, and zinc. Without exploratory drilling, the presence of mineralized rocks beneath the volcanic rocks of the study areas cannot be determined.

The resource potential for oil, gas, and coal in the study areas is low. The study areas do not contain rocks favorable for oil and gas accumulation or coal formation. Holes drilled in the region to depths of more than 11,000 ft did not penetrate sedimentary rocks.

Two geothermal resource areas are immediately adjacent to the Gooding City of Rocks East and West Wilderness Study Areas, and large areas favorable for the discovery and development of low-temperature geothermal resources have been indicated to the north and southwest of the study areas. However, no surface manifestations are present in the study areas. For these reasons, the potential for geothermal energy is moderate.

INTRODUCTION

The Gooding City of Rocks East (ID–54–8a) and Gooding City of Rocks West (ID–54–8b) Wilderness Study Areas, in Gooding County, Idaho, comprise 14,743 acres and 6,287 acres, respectively. At the request of the U.S. Bureau of Land Management, only 13,063 acres of the Gooding City of Rocks East Wilderness Study Area were studied. The two study areas are separated by a north-south four-wheel-drive road. The two areas are discussed together in this report and are referred to jointly as the "Gooding City of Rocks Wilderness Study Areas" or simply "the study areas." The study areas are about 15 mi north-northwest of Gooding and about 12 mi due south of the small town of Fairfield (fig. 1). They are bounded on the northern, eastern, and southern sides by four-wheel-drive roads; study area ID–54–8b is bounded on the western side by the East Fork of Clover Creek. Access to the study areas is provided by those dirt roads that are passable except during periods of rain or thaw. Elevations range from 5,615 ft in the northwestern part of study area ID–54–8b to 4,000 ft on Clover Creek.

Six deeply incised canyons separated by basalt-covered plateaus make up the study areas. Each canyon is characterized by a central deep, narrow channel having very few tributaries (pl. 1). Canyon streams drain southward into Clover Creek. Steep gorges have developed along most of the canyons, and the resulting landscape is one of spectacular arches, pillars, and sculptured rock. The canyon bottoms, as much as 400 ft below the plateaus, are generally densely covered with cottonwoods, which give way to sagebrush along canyon slopes and plateaus.

Investigations by the U.S. Bureau of Mines

During 1984 and 1985, the U.S. Bureau of Mines (USBM) undertook investigations to appraise the identified resources of the study areas (Moyle, 1985). Prior to field studies, published information was researched and Gooding County and U.S. Bureau of Land Management (BLM) mining and mineral lease records were examined. USBM, state, and other production records were searched and pertinent data were compiled. Claim owners were contacted for permission to examine properties and publish the results.

Frederic L. Kadey, Jr. (consultant, Industrial Minerals, Englewood, Colo.), an acknowledged expert in the evaluation of diatomite deposits, was consulted about the Clover Creek deposit and accompanied USBM personnel on a one-day visit to the field. Field studies involved searches for all mines, prospects, and claims indicated by library research to be in the study areas. Those found were mapped and sampled. Claims outside, but near, the study areas were also studied to determine whether mineralized zones might extend into the areas. Ground and air reconnaissance surveys were used to identify significant geologic structures and zones of alteration related to mineral deposits.

Lode samples were collected by USBM personnel at mines and prospects. Samples were also taken of country rock for chemical analysis, petrographic analysis, and density determination; sand and gravel was sampled to look for placer gold. Diatomite samples were examined microscopically by the USBM; suitable samples were submitted to the Manville Service Corporation for analyses.

We would like to acknowledge the help of Larry Dee, district geologist at the Shoshone BLM office. Frederick L. Kadey, Jr., visited the diatomite deposit at Clover Creek and instructed USBM personnel in identification and evaluation of diatomite. Edward and Leroy Strout accompanied Phillip Moyle to the diatomite deposit and also provided important production data. Identified resources are classified according to the guidelines set up by the U.S. Bureau of Mines and the U.S. Geological Survey (1980).

Investigations by the U.S. Geological Survey

The U.S. Geological Survey (USGS) undertook investigations in the summer of 1984 to assess the potential for undiscovered mineral resources of the wilderness study areas. The work consisted of geologic mapping at a 1:62,500 scale, combined with stream-sediment and rock sampling and subsequent analyses of the samples. Black-and-white and color aerial photographs were used to supplement the geologic mapping and to locate faults.

Chapter C

Mineral Resources of the Sand Butte Wilderness Study Area, Lincoln County, Idaho, and the Raven's Eye Wilderness Study Area, Blaine and Lincoln Counties, Idaho

By MARGO I. TOTH, BARBARA B. NEVINS, and
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ALAN R. BUEHLER and PHILLIP R. MOYLE
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1721

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
SOUTH-CENTRAL IDAHO

Mineral Resources of the Sand Butte Wilderness Study Area, Lincoln County, Idaho, and the Raven's Eye Wilderness Study Area, Blaine and Lincoln Counties, Idaho

By Margo I. Toth, Barbara B. Nevins, *and* Dolores M. Kulik,
U.S. Geological Survey, *and*

Alan R. Buehler *and* Phillip R. Moyle,
U.S. Bureau of Mines

SUMMARY

The Sand Butte (ID–057–008) Wilderness Study Area, Lincoln County, Idaho, and the Raven's Eye (ID–057–010) Wilderness Study Area, Blaine and Lincoln Counties, Idaho, are southeast of the small town of Carey and southwest of the Craters of the Moon National Monument. A joint mineral resource study of the areas was completed in the summer of 1985 by the U.S. Geological Survey and the U.S. Bureau of Mines. The two wilderness study areas have low mineral resource potential for undiscovered metals, oil and gas, coal, and geothermal energy. Both wilderness study areas contain resources of decorative stone, and the Raven's Eye Wilderness Study Area also contains subeconomic resources of volcanic cinder.

Access to the wilderness study areas is provided by U.S. Highway 93 on the western and northern boundaries, and by secondary and unimproved roads along the eastern and southern boundaries. Rocks in the two areas are young basalt flows of the Snake River Plain that have a flat, moonscape terrain, which includes ridges, craters, fissures, depressions, crevices, and sparse vegetation. A few isolated volcanic buttes rise several hundred feet above the essentially flat terrain.

The Sand Butte Wilderness Study Area contains 2 tons of indicated subeconomic resources of decorative stone; several more tons, covered by a thin layer of loess, may occur nearby. The Raven's Eye Wilderness Study Area contains 18,000 tons of indicated reserves, 12,000 tons of indicated subeconomic resources, and 10,000 tons of inferred subeconomic resources of decorative stone. The area also contains 140,000 tons of identified resources of volcanic cinders and small occurrences of sand and gravel.

As part of this study, 73 rock samples and 1 water sample were collected for analysis. A stream-sediment sampling program could not be undertaken because of the lack of stream channels or sediment. None of the rock samples contained anomalous concentrations of any of the 31 elements for which we analyzed. Water sampled from a hot spring north of the Raven's Eye Wilderness Study Area did not contain anomalous concentrations of any of the analyzed elements. Geophysical studies suggest that the study areas are underlain by basalt, which thickens to the south of the study areas.

Both wilderness study areas have low mineral resource potential for undiscovered resources of all metals. The areas studied lack known host rocks and structures favorable for the occurrence of undiscovered oil, gas, or coal; thus the mineral resource potential for these commodities is also low. The potential of the occurrence of undiscovered oil, gas, or coal resources in the poorly known underlying rocks is also low.

Although hot springs occur to the north of the study areas, no thermal waters are known within the areas. The resource potential for undiscovered geothermal energy in the wilderness study areas is low.

INTRODUCTION

Young basalt flows cover the 20,792 acres of the Sand Butte (ID–057–008) Wilderness Study Area, Lincoln County, Idaho, and the 67,110 acres of the Raven's Eye (ID–057–010) Wilderness Study Area, Blaine and Lincoln Counties, Idaho. Because the two areas studied are contiguous and geologically similar, they are discussed together in this report.

Unimproved dirt roads form most of the boundary of the Sand Butte Wilderness Study Area. To the north, the Raven's Eye Wilderness Study Area is separated from the Sand Butte area by one of these roads (fig. 1). The Little Wood River is just west of the Raven's Eye Wilderness Study Area, and the western boundary is less than 2 mi (miles) east of the small towns of Carey and Tikura. The eastern boundary is less than 7 mi west of the Craters of the Moon National Monument.

U.S. Highway 93 roughly parallels part of the western and northern boundaries of the Raven's Eye Wilderness Study Area. The boundaries for both study areas are accessible by secondary and unimproved roads, and one four-wheel-drive road crosses Raven's Eye from Spud to Monument Butte; however, the interiors of the study areas are mostly inaccessible by vehicle because of the extemely rough surface of the young basalt flows.

The Sand Butte and Raven's Eye Wilderness Study Areas feature a flat, moonscape terrain, which includes ridges, craters, fissures, depressions, crevices, and a few isolated volcanic buttes rising several hundred feet above the terrain. Elevations in the Sand Butte Wilderness Study Area range from a low of 4,500 ft (feet) at the southern margin of the area, to a high of 4,974 ft at Sand Butte. In the Raven's Eye Wilderness Study Area, elevations range from about 4,600 ft at the southeastern edge of the study area to 5,003 ft at Spud Butte. Little or no vegetation grows on the younger lava flows, but bunch grass and sage cover the older lava flows. Perennial streams are not present within either study area, but there are ephemeral streams along the northern and northeastern margins of the Raven's Eye Wilderness Study Area.

This report presents an evaluation of the mineral endowment (identified resources and mineral resource potential) of the study area and is the product of several separate studies by the U.S. Bureau of Mines (USBM) and the U.S. Geological Survey (USGS). Identified resources are classified according to the system of the U.S. Bureau of Mines and the U.S. Geological Survey (1980) which is shown in the appendix of this report. Mineral resource potential is the likelihood of occurrence of undiscovered concentrations of metals and nonmetals, of unappraised industrial rocks and minerals, and of undiscovered energy sources (coal, oil, gas, oil shale, and geothermal sources). It is classified according to the system of Goudarzi (1984), which is shown in the appendix of this report.

EXPLANATION

▨	Area with identified resources of decorative stone
◆c	Area with identified resources of cinder
L/C	Terrane having low mineral resource potential for metals, oil, gas, coal, and geothermal energy, with certainty level C

Investigations by the U.S. Bureau of Mines

Work by USBM personnel entailed pre-field, field, and report preparation phases in 1985 and 1986. Pre-field studies included library research, review of aerial photographs, and perusal of U.S. Bureau of Land Management (BLM) mining and mineral lease records and of USBM and other production records. Field studies involved air and ground searches for deposits of decorative stone in localities chosen from aerial photographs. Areas with high concentrations of decorative stone were examined and, where warranted, mapped and sampled.

Areas that have high concentrations of decorative stone, traced from aerial photographs, are areas that have a high percentage of slab pahoehoe (smooth, ropy-textured lava). Six samples of stone suitable for decorative veneer were taken to determine the apparent density for resource calculation. Each sample was cut into a cube with a rock saw, and volume of the sample was determined. Apparent density was calculated by dividing the weight of the sample by the volume.

Cinder resources were calculated for a small spatter cone in SW¼ sec. 3, T. 2 S., R. 22 E. (pl. 1). Volume was determined by digitizing 10-ft contours of the cinder cone and applying Simpson's rule, a rule to determine the volume of an irregular shape. Apparent density was calculated by the same method used to calculate the density of decorative stone.

Investigations by the U.S. Geological Survey

The USGS undertook a mineral resource assessment of the Sand Butte and Raven's Eye Wilderness Study Areas in the summer of 1985. The work consisted of field checking previous mapping by LaPoint (1977), collecting rock samples, and reviewing the geology and published geochemistry of the Snake River Plain basalts. A stream-sediment sampling program was not undertaken because of the absence of flowing streams within the study areas and the lack of streams outside of the boundaries which exclusively drained the areas studied.

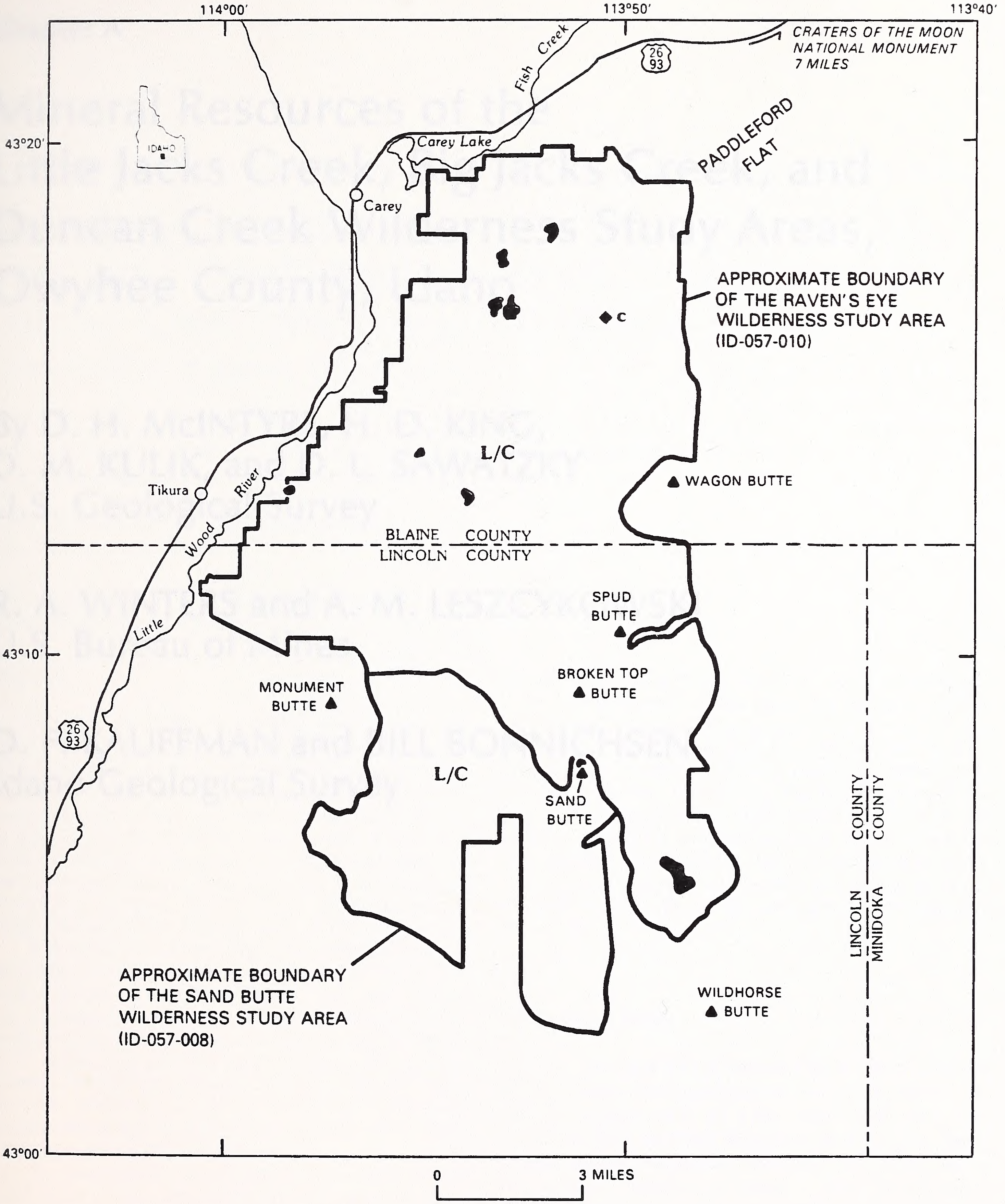

Figure 1 (above and facing page). Map showing mineral resource potential, identified resources, and location of the Sand Butte and Raven's Eye Wilderness Study Areas, Idaho

Chapter A

Mineral Resources of the Little Jacks Creek, Big Jacks Creek, and Duncan Creek Wilderness Study Areas, Owyhee County, Idaho

By D. H. McINTYRE, H. D. KING,
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U.S. GEOLOGICAL SURVEY BULLETIN 1720

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—
BRUNEAU RIVER-JACKS CREEK REGION, IDAHO

MINERAL RESOURCES OF WILDERNESS STUDY AREAS—BRUNEAU RIVER–JACKS CREEK REGION, IDAHO

Mineral Resources of the Little Jacks Creek, Big Jacks Creek, and Duncan Creek Wilderness Study Areas, Owyhee County, Idaho

By D. H. McIntyre, H. D. King, D. M. Kulik, *and* D. L. Sawatzky
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SUMMARY

In 1985 and 1986, the USBM (U.S. Bureau of Mines), the USGS (U.S. Geological Survey), and the Idaho Geological Survey conducted investigations to appraise the mineral resources and assess the mineral resource potential of the Little Jacks Creek (ID–111–006), Big Jacks Creek (ID–111–007C), and Duncan Creek (ID–111–007B) Wilderness Study Areas. These investigations revealed no identified mineral resources and a low mineral resource potential for tin and all other metals, oil and gas, and geothermal energy in the three study areas.

The Little Jacks Creek, Big Jacks Creek, and Duncan Creek Wilderness Study Areas are located in southwestern Idaho, south of the Snake River Plain. These three contiguous study areas are underlain chiefly by Miocene rhyolitic rocks that are locally covered by a thin veneer of basalt and locally separated by a thin deposit of poorly consolidated sedimentary rocks and silicic ash. The rock sequence is cut by numerous northwest-trending high-angle faults of small displacement. None of the rocks are hydrothermally altered.

No minerals have been produced and there are no known mineralized areas in the wilderness study areas. No mines, prospects, mineralized areas, patented mining claims, or mineral leases were identified in the study areas. Sand, gravel, and industrial rock resources are in the study areas, but sufficient quantities are available elsewhere to satisfy current local needs.

Nonmagnetic heavy-mineral concentrates collected during the stream-sediment geochemical survey locally contain high values for tin and lead. Very fine sand size to silt-size cassiterite (variety wood tin) occurs in the tin-rich samples. The cassiterite probably is derived from the sedimentary rocks locally present between the rhyolitic rocks and the basalt; its ultimate source is probably outside the wilderness study areas. The high lead values are probably man-caused contaminants. The wilderness study areas have a low mineral resource potential for undiscovered tin associated with the sedimentary rocks beneath the basalt and for all other metals. The potential for undiscovered oil and gas and geothermal resources also is low.

INTRODUCTION

In 1985, the USGS and the USBM, in cooperation with the Idaho Geological Survey, conducted mineral resource investigations in the Little Jacks Creek, Big Jacks Creek, and Duncan Creek Wilderness Study Areas. These three contiguous wilderness study areas (fig. 1) encompass 93,275 acres, divided as follows: Little Jacks Creek, 34,000 acres; Big Jacks Creek, 49,875 acres; Duncan Creek, 9,400 acres. The areas are located on a gently rolling plateau into which the gorges of Little Jacks Creek, Big Jacks Creek, and Duncan Creek are incised; these gorges commonly are a thousand or more feet deep. State Highway 51 passes east of the wilderness study areas. Light-duty roads and jeep trails provide access to

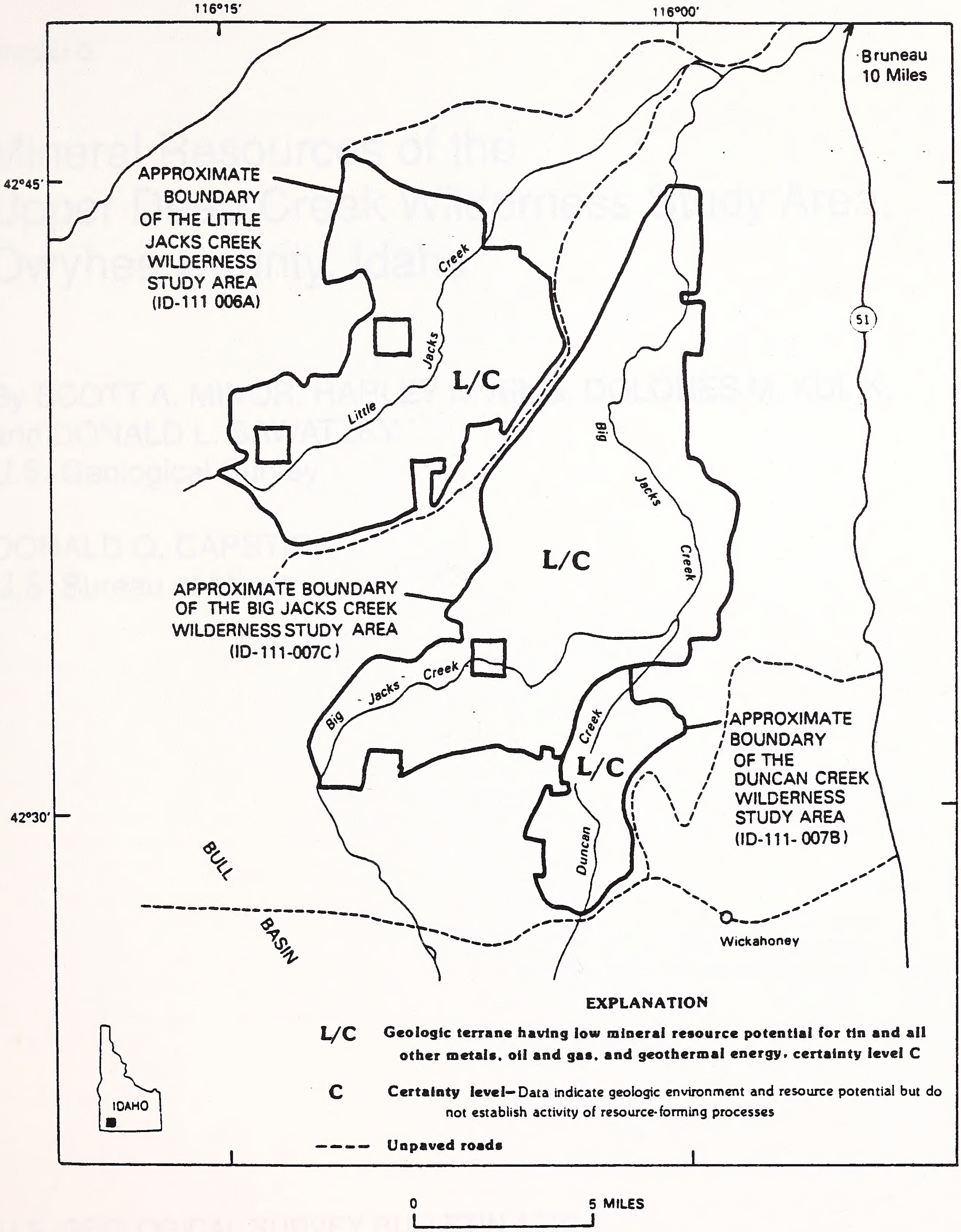
116°15'
116°00'
42°45'
42°30'
Bruneau
10 Miles
51
APPROXIMATE BOUNDARY OF THE LITTLE JACKS CREEK WILDERNESS STUDY AREA (ID-111 006A)
Little Jacks Creek
L/C
Big Jacks Creek
L/C
APPROXIMATE BOUNDARY OF THE BIG JACKS CREEK WILDERNESS STUDY AREA (ID-111-007C)
Big Jacks Creek
Creek
L/C
Duncan
APPROXIMATE BOUNDARY OF THE DUNCAN CREEK WILDERNESS STUDY AREA (ID-111-007B)
BULL BASIN
Wickahoney
IDAHO
EXPLANATION
L/C Geologic terrane having low mineral resource potential for tin and all other metals, oil and gas, and geothermal energy, certainty level C
C Certainty level—Data indicate geologic environment and resource potential but do not establish activity of resource-forming processes
Unpaved roads
0
5 MILES

Figure 1. Map showing location and mineral resource potential of the Little Jacks Creek, Big Jacks Creek, and Duncan Creek Wilderness Study Areas, southwestern Idaho.

Chapter G

Mineral Resources of the Upper Deep Creek Wilderness Study Area, Owyhee County, Idaho

By SCOTT A. MINOR, HARLEY D. KING, DOLORES M. KULIK,
and DONALD L. SAWATZKY
U.S. Geological Survey

DONALD O. CAPSTICK
U.S. Bureau of Mines

U.S. GEOLOGICAL SURVEY BULLETIN 1719

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
OWYHEE RIVER REGION, IDAHO AND NEVADA

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
OWYHEE RIVER REGION, IDAHO AND NEVADA

Mineral Resources of the Upper Deep Creek Wilderness Study Area Owyhee County, Idaho

By Scott A. Minor, Harley D. King, Dolores M. Kulik,
and Donald L. Sawatzky
U.S. Geological Survey

Donald O. Capstick
U.S. Bureau of Mines

SUMMARY

Abstract

The Upper Deep Creek Wilderness Study Area (ID-111-044) is located on the northern Owyhee Plateau in southwest Idaho and encompasses 11,510 acres, of which the U.S. Geological Survey and the U.S. Bureau of Mines were asked to study 5,700 acres. Hereafter, the terms "study area" and "wilderness study area" refer only to the smaller acreage. Field work for this report was conducted in 1985 to assess the identified mineral resources (known) and mineral resource potential (undiscovered) of the area. No mines, prospects, or claims are located in the study area and there are no identified mineral or energy resources. The study area has moderate resource potential for small gold placers and low potential for gold and silver resources in epithermal (hydrothermal) deposits. The study area also has low potential for tin and uranium resources; the southern part has low potential for diatomite resources. The potential for oil, gas, and geothermal energy resources in the study area is low.

Character and Setting

The Upper Deep Creek Wilderness Study Area is located on the northern Owyhee Plateau of southwest Idaho (fig. 1), about 80 mi southwest of Boise. The terrain is characterized by a stream-dissected plateau, averaging about 5,300 ft in elevation, with several prominent canyons, including the 200- to 400-ft-deep canyon of Deep Creek that extends the length of the study area. The surrounding Owyhee Plateau is underlain by a thick (greater than 800 ft) flat-lying sequence of Miocene (see appendix for geologic time chart) rhyolitic ash-flow tuffs, basalt flows, and minor interbedded sedimentary rocks. A thick rhyolitic ash-flow tuff is exposed in most of the study area; the tuff is overlain in the southern part by a sequence of thin basalt flows and basal sedimentary rocks (fig. 2). Geologic and geophysical data indicate that the study area lies within a large collapsed caldera. The ash-flow tuff and overlying units are interpreted to be part of a post-collapse sequence that has filled and buried most of the caldera. A small (0.5 by 0.25 mi) basalt maar crater (Indian Lake, fig. 2) is located directly east of the study area.

Identified Resources

No mining claims were located and no minerals were produced in the study area. There are no identified mineral or energy resources within the study area.

Mineral Resource Potential

There is moderate resource potential for placer gold resources obtained by recreational, suction-dredge methods along the Deep Creek stream bed (fig. 2); relatively high concentrations of particulate gold were identified in sand and gravel bars along the creek within the study area.

The entire study area has a low potential for gold and silver resources in epithermal deposits (fig. 2). This is indicated by weak, sporadic geochemical anomalies, and the presence of placer gold. Altered

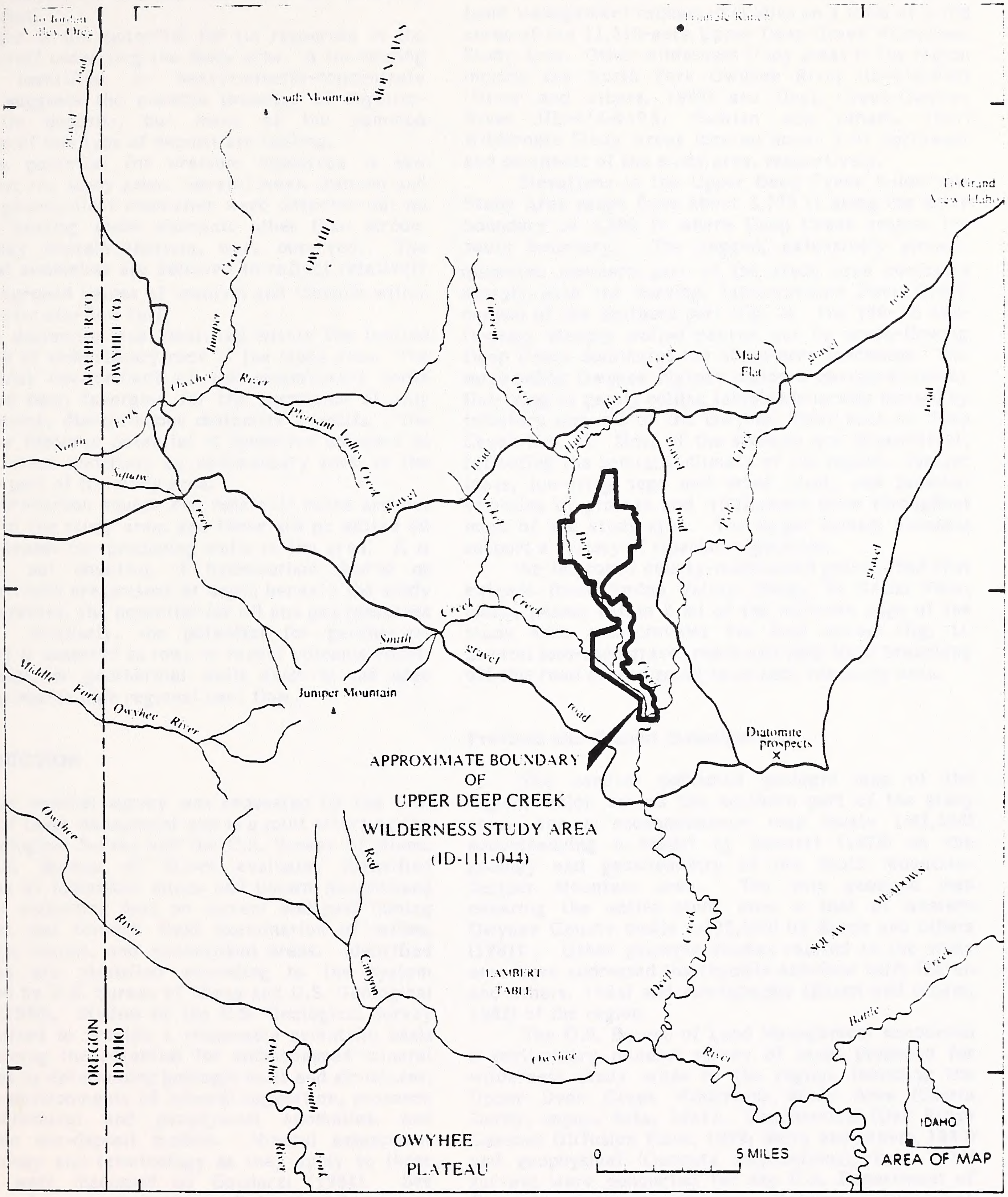

Figure 1. Index map showing location of Upper Deep Creek Wilderness Study Area, Owyhee County, Idaho.

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rock is generally lacking, and any occurrences of precious metals in near-surface rocks are probably insignificant.

There is low potential for tin resources in the rhyolitic tuff underlying the study area. A tin-bearing mineral identified in heavy-mineral-concentrate samples suggests the possible presence of rhyolite-hosted tin deposits, but many of the common attributes of this type of deposit are lacking.

The potential for uranium resources is low throughout the study area. Several weak uranium and thorium geochemical anomalies were detected but no minerals bearing these elements other than zircon, which may contain thorium, were observed. The elemental anomalies are believed to reflect relatively high background values of uranium and thorium within the rhyolitic ash-flow tuff.

No diatomite was identified within the limited exposures of sedimentary rock in the study area. The depositional environment of the sedimentary rocks may have been favorable for the formation of only small-volume, discontinuous diatomite deposits. The diatomite resource potential is therefore assessed as low for areas underlain by sedimentary rock in the southern part of the study area.

Hydrocarbon source and reservoir rocks are not present in the study area, and there are no active oil and gas leases nor producing wells in the area. It is unknown, but doubtful, if hydrocarbon source or reservoir rocks are present at depth beneath the study area; therefore, the potential for oil and gas resources is low. Similarly, the potential for geothermal resources is assessed as low; no recent volcanic rocks, hot springs, or geothermal wells exist in the area despite probable high regional heat flow.

INTRODUCTION

This mineral survey was requested by the U.S. Bureau of Land Managment and is a joint effort by the U.S. Geological Survey and the U.S. Bureau of Mines. The U.S. Bureau of Mines evaluates identified resources at individual mines and known mineralized areas by collecting data on current and past mining activities and through field examination of mines, prospects, claims, and mineralized areas. Identified resources are classified according to the system described by U.S. Bureau of Mines and U.S. Geological Survey (1980). Studies by the U.S. Geological Survey are designed to provide a reasonable scientific basis for assessing the potential for undiscovered mineral resources by determining geologic units and structures, possible environments of mineral deposition, presence of geochemical and geophysical anomalies, and applicable ore-deposit models. Mineral assessment methodology and terminology as they apply to these surveys were discussed by Goudarzi (1984). See appendix for the definition of levels of mineral resource potential, certainty of assessment, and classification of identified resources.

Character and Setting

The Upper Deep Creek Wilderness Study Area is located about 35 mi southeast of Jordan Valley, Oreg., and 80 mi southwest of Boise on the northern Owyhee Plateau of southwest Idaho (fig. 1). The U.S. Bureau of Land Management requested studies on a total of 5,700 acres of the 11,510-acre Upper Deep Creek Wilderness Study Area. Other wilderness study areas in the region include the North Fork Owyhee River (ID-016-040) (Minor and others, 1986) and Deep Creek-Owyhee River (ID-016-049A) (Sawlan and others, 1987) Wilderness Study Areas located about 3 mi northwest and southeast of the study area, respectively.

Elevations in the Upper Deep Creek Wilderness Study Area range from about 5,770 ft along the north boundary to 4,800 ft where Deep Creek crosses the south boundary. The rugged, extensively stream-dissected northern part of the study area contrasts sharply with the curving, table-rimmed Deep Creek canyon of the southern part (fig. 2). The 200- to 400-ft-deep, steeply walled canyon cut by south-flowing Deep Creek dominates the study-area landscape. The surrounding Owyhee Plateau region is characterized by flat-lying to gently rolling tablelands locally incised by tributary streams of the Owyhee River such as Deep Creek (fig. 1). Most of the streams are intermittent, reflecting the semiarid climate of the region. Juniper trees, low-lying sage and other brush, and seasonal varieties of grasses and wildflowers grow throughout most of the study area. The larger stream channels support a variety of riparian vegetation.

An improved county-maintained gravel road that extends from Jordan Valley, Oreg., to Grand View, Idaho, passes within 2 mi of the northern edge of the study area and provides the best access (fig. 1). Several less-used gravel roads and jeep trails branching off this road extend south to or near the study area.

Previous and Present Investigations

The earliest published geologic map of the region, which covers the northern part of the study area, was a reconnaissance map (scale 1:62,500) accompanying a report by Bennett (1976) on the geology and geochemistry of the South Mountain-Juniper Mountain area. The only geologic map covering the entire study area is that of western Owyhee County (scale 1:125,000) by Ekren and others (1981) . Other geologic studies related to the study area have addressed the rhyolite ash-flow tuffs (Ekren and others, 1984) and stratigraphy (Ekren and others, 1982) of the region.

The U.S. Bureau of Land Management conducted a preliminary mineral survey of lands proposed for wilderness study areas in the region, including the Upper Deek Creek Wilderness Study Area (Gloria Derby, unpub. data, 1981). Geochemical (Oak Ridge Gaseous Diffusion Plant, 1982; Berry and others, 1982) and geophysical (Geodata International, Inc., 1979) surveys were conducted for the U.S. Department of Energy's National Uranium Resource Evaluation (NURE) program to assess the radioactive mineral potential of the region. A geology, energy, and mineral (GEM) resources report was prepared by Mathews and Blackburn (1982) for the Pole Creek GEM Resource Area, which includes the Upper Deep Creek Wilderness Study Area.

The U.S. Geological Survey conducted field investigations in the study area in the summer of

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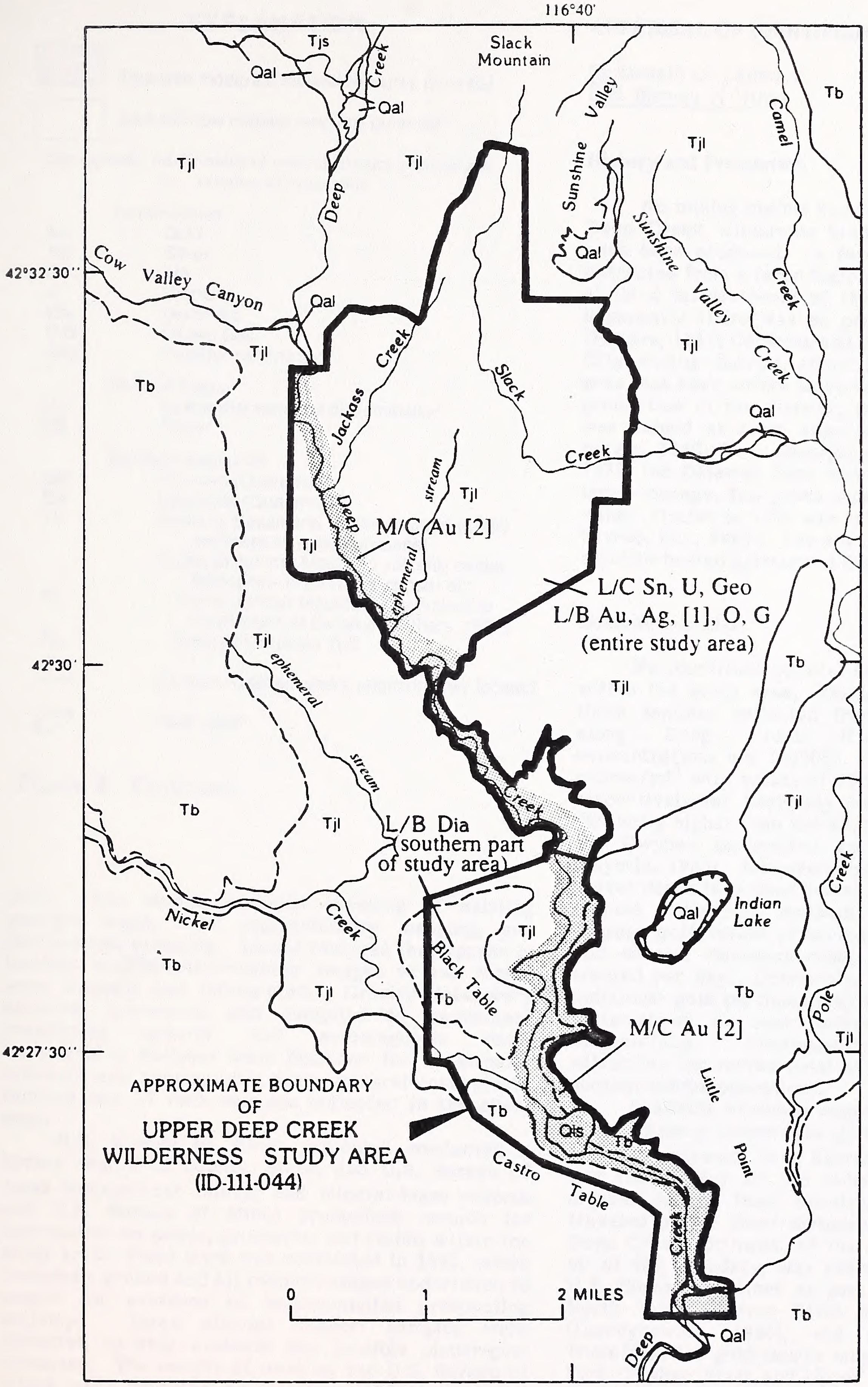

Figure 2. Mineral resource potential and geology of Upper Deep Creek Wilderness Study Area, Owyhee County, Idaho. Geology modified from Ekren and others (1981).

EXPLANATION

▨	Area with moderate mineral resource potential
☐	Area with low mineral resource potential

See appendix for definition of mineral resource potential and certainty of assessment

Commodities

Au	Gold
Ag	Silver
Sn	Tin
U	Uranium
Dia	Diatomite
O,G	Oil and Gas
Geo	Geothermal energy

Deposit types

[1]	Epithermal vein and dissemination
[2]	Placer

Geologic map units

Qal	Alluvium (Quaternary)
Qls	Landslide (Quaternary)
Tb	Banbury Basalt and unnamed interbedded sedimentary rocks (Miocene)
	Rocks of Juniper Mountain volcanic center (Miocene)--In this area, consist of:
Tjl	Tuff of Juniper Mountain (equivalent to lower lobes of Ekren and others, 1981)
Tjs	Swisher Mountain Tuff

—	Contact--Dashed where approximately located
⬭	Maar crater

Figure 2. Continued.

1985. The studies included checking of existing geologic maps, local supplementary mapping, and geochemical sampling. Linear features that appear in Landsat multispectral-scanner images of the region were mapped and interpreted. Gravity data were acquired, processed, and compiled to supplement preexisting gravity and aeromagnetic data. Geochemical analyses were obtained for 11 stream-sediment and nonmagnetic heavy-mineral-concentrate samples and 17 rock samples collected in the study area.

U.S. Bureau of Mines personnel conducted a library search of county, state, and U.S. Bureau of Land Management mining and mineral-lease records and U.S. Bureau of Mines production records for information on mines, prospects, and claims within the study area. Field work was conducted in 1985, which included a ground and air reconnaissance undertaken to search for evidence of undocumented prospecting activity. Three alluvial (placer) samples were collected to help evaluate any possible placer-gold resources. The results of work by the U.S. Bureau of Mines were reported by Capstick (1986). Detailed information is availible from the U.S. Bureau of Mines, Western Field Operations Center, E. 360 Third Avenue, Spokane, WA 99202.

APPRAISAL OF IDENTIFIED RESOURCES

By Donald O. Capstick
U.S. Bureau of Mines

History and Production

No mining claims have been located in the Upper Deep Creek Wilderness Study Area, and no minerals have been produced. A few tons of diatomite were extracted from a large diatomite deposit (Staley, 1964) about 5 mi southeast of the study area (fig. 1), but apparently there was no production since the 1930's (Powers, 1947; Capstick and Buehler, 1985). The Silver City mining district, about 35 mi north of the study area, has been active since 1863. Early gold and silver production in the district, from 1863 to about 1914, was valued at more than \$40 million (Rodgers and others, 1980) from underground and placer mines. In 1977, the Delamar mine was reopened as an open-pit, large-tonnage, low-grade disseminated silver and gold mine. Output in 1985 was valued at about \$20 million (Nerco, Inc., 1985). The silver and gold are in Miocene rhyolite-hosted epithermal deposits.

Mineral Deposits

No identified mineral resources were delineated within the study area. Gold, however, was found in three samples collected from sand and gravel bars along Deep Creek (Capstick, 1986); gold concentrations are 0.00052, 0.00054, and 0.0068 troy ounces/yd^3 with values of \$0.21, \$0.22, and \$2.72/yd^3, respectively (at \$400/troy ounce). These values are distinctly higher than the \$0.02/yd^3 average typical of the Owyhee canyonland and drainages (Gabby and Mayerle, 1985). However, the volume of the sand and gravel deposits is insufficient to be minable by large-volume commercial methods. Such methods require average gold values of several dollars per cubic yard and several thousand cubic yards of gravel to be treated per day. Commonly, the size and number of individual gold particles may increase dramatically in material on or near bedrock, raising the values substantially. Consequently, the area may be attractive for recreational or small-scale commercial suction-dredge operations.

Available evidence suggests that the gold came from a nearby source; the gold is bright, indicating it may have recently been liberated from the host rock, and the surface of the individual gold particles is angular rather than rounded, indicating they had traveled only a short distance. The area drained by Deep Creek northwest of the study area, to within 4 mi of the boundary, was examined previously by the U.S. Bureau of Mines as part of their study of the North Fork Owyhee River Wilderness Study Area (Leszcykowski, 1986), and no gold was found. Therefore, the gold source may lie between the North Fork Owyhee River and Upper Deep Creek Wilderness Study Areas or within the northeastern part of the Upper Deep Creek Wilderness Study Area.

Blocky basalt forming the tables and canyon rims in the southern part of the study area (Banbury Basalt,